

# PUBLIC WORKS

*city  
county  
and state*

*April  
1950*

## LEADERS IN THE PUBLIC WORKS FIELD



**Pere F. Seward** is Commissioner of Community Facilities Service of the General Services Administration (successor to the Federal Works Agency). A veteran of World War I, he has been an engineer with the Maryland and North Carolina State Road Commissions; an engineer with the ARBA; and, during World War II, director of the Projects Division of the Federal Emergency Administration of Public Works. Mr. Seward contributed to our January issue an article on "How to Get Funds for Public Works Advance Planning." We congratulate Mr. Seward on a distinguished record of engineering and public service.

**Consulting Engineers  
Report on New Work**

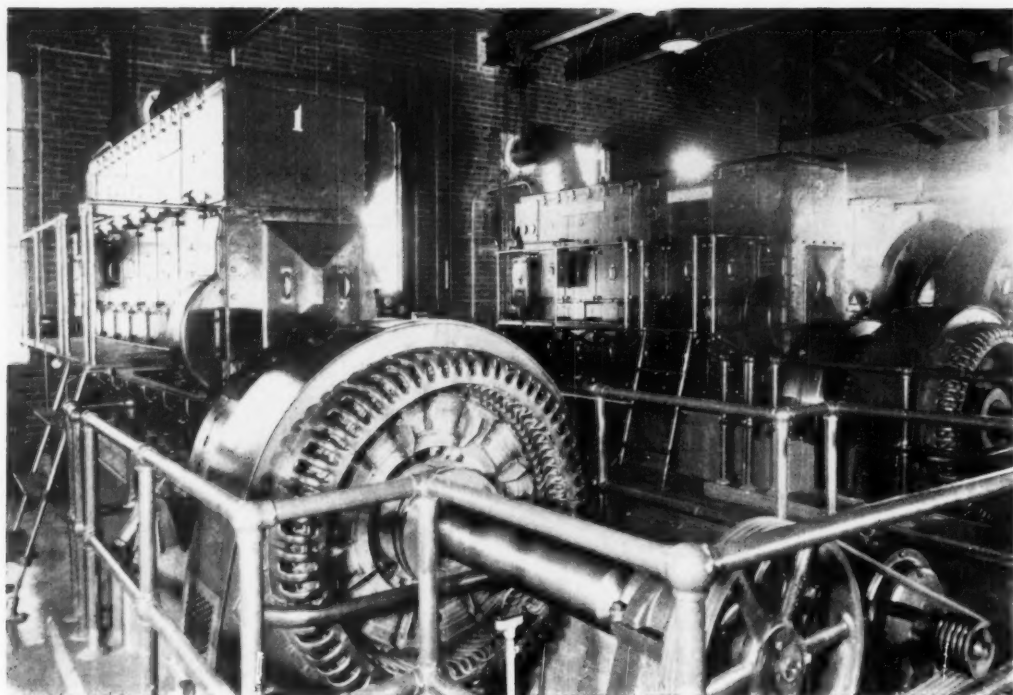
**Eliminating Rough Streets  
With Asphaltic Concrete**

**New Mining-Settling Basins  
Give Longer Filter Runs**

**Using Equipment on  
County Highway Work**

**Sampling Water Borne  
Industrial Wastes**

**Revitalizing Deep Wells  
For Increased Yield**



## These Superior Engines Saved \$20,000 Operating at 40% Capacity

In an Illinois town two Superior Dual Fuel engines have slashed electrical power costs. And it was done under adverse operating conditions.

Two identical turbocharged Dual Fuel Superior Diesels were fitted into the old steam generator building without disrupting service. And because the city fathers wanted ample capacity for supplying future current requirements, they purchased large units that would operate initially at partial loads.

In spite of the fact that this load factor averaged less than 40%, these two Superior Diesels saved \$20,000 in their first year of operations. When natu-

ral gas becomes available soon, it is estimated that savings will increase an additional \$10,000 a year.

If you're looking for ways to cut power costs or increase generating capacity, it will pay you to talk to a Superior representative. One will be glad to call on you at any time—just name the date. And, of course, we'll be glad to send you a copy of our new, fully illustrated booklet, *Superior Diesel For Stationary Application*.

### THE NATIONAL SUPPLY COMPANY SUPERIOR ENGINE DIVISION

Plant and General Sales Office: Springfield, Ohio



*Superior*  
**DIESELS**

**Locomotive • Marine • Oil Field • Stationary**

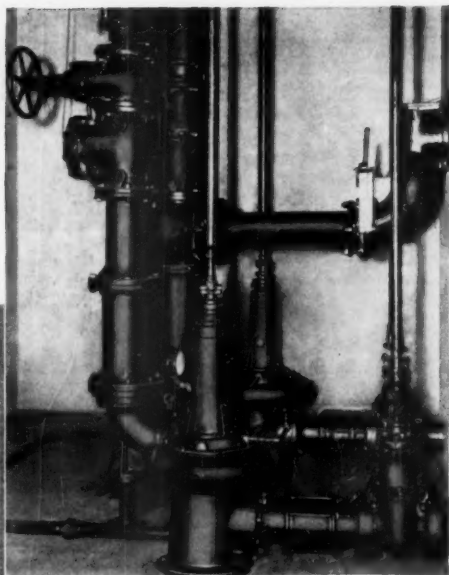
**CLOG-PROOF**

**RELIABLE**

There's no substitute for  
The "Chicago"

**FLUSH-KLEEN**

**Sewage Ejector of Proved Performance**



"Flush-Kleens" are absolutely clog-proof . . . the impellers handle nothing but strained sewage, minimizing wear and maintaining pump balance. They need no manual attention other than lubrication and inspection. No labor is needed to dis-assemble and clean. Not just another practically non-clog pump—"Flush-Kleens" are *positively* clog-proof.

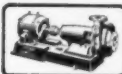
**Look at These Long-established Facts**

- "Flush-Kleens" are the only absolutely clog-proof sewage pumps; impellers are not required to pass any solids.
- The "Flush-Kleen" will pump anything that will pass through the pipe regardless of type or quantity of material.
- "Flush-Kleen" selection is not limited to a narrow pumping range to prevent dynamic unbalance of the impeller and consequent shaft and bearing failure.
- "Flush-Kleen" versatility and flexibility of operation make selection of the proper unit simple for small stations where accurate capacity and head figures are often not available.

**CHICAGO PUMP COMPANY**  
**SEWAGE EQUIPMENT DIVISION**

**2348 WOLFRAM STREET**

Flush Kleen, Scrub-Peller, Plunger.  
Horizontal and Vertical Non-Clogs  
Water Seal Pumping Units, Samplers.

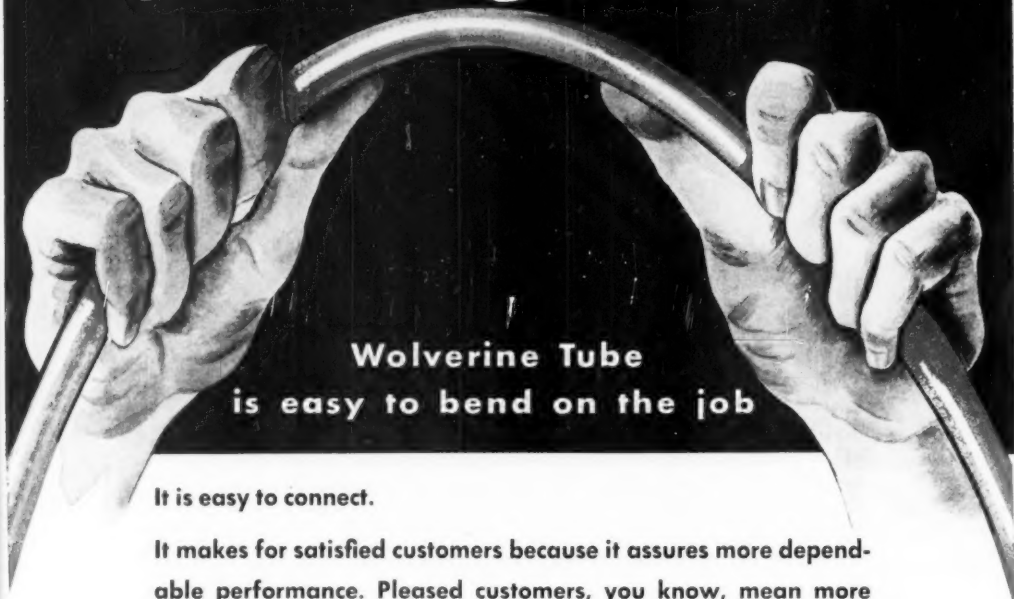


**CHICAGO 18, ILLINOIS**

Swing Diffusers, Stationary Diffusers,  
Mechanical Aerators, Combination  
Aerator-Clarifiers, Comminutors.

Write for further  
information and  
test data on Chi-  
cago Pump Com-  
pany "Flush-  
Kleen" Sewage  
Ejectors.

# *Take* Wolverine Copper Tube on your jobs and you'll make your work *Easier*



**Wolverine Tube  
is easy to bend on the job**

**It is easy to connect.**

**It makes for satisfied customers because it assures more dependable performance. Pleased customers, you know, mean more business for you.**

*There IS a difference in tubing ~ ~*

**ALWAYS SPECIFY WOLVERINE**

## **WOLVERINE TUBE DIVISION**

**Calumet & Hecla Consolidated Copper Company**

INCORPORATED

**MANUFACTURERS OF SEAMLESS NON-FERROUS TUBING**

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*Plants at Detroit, Mich., and Decatur, Ala.*



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# Public Works

THE ENGINEERING AUTHORITY  
IN THE CITY-COUNTY FIELD

Edited by  
W. A. HARDENBERGH and A. PRESCOTT FOLWELL

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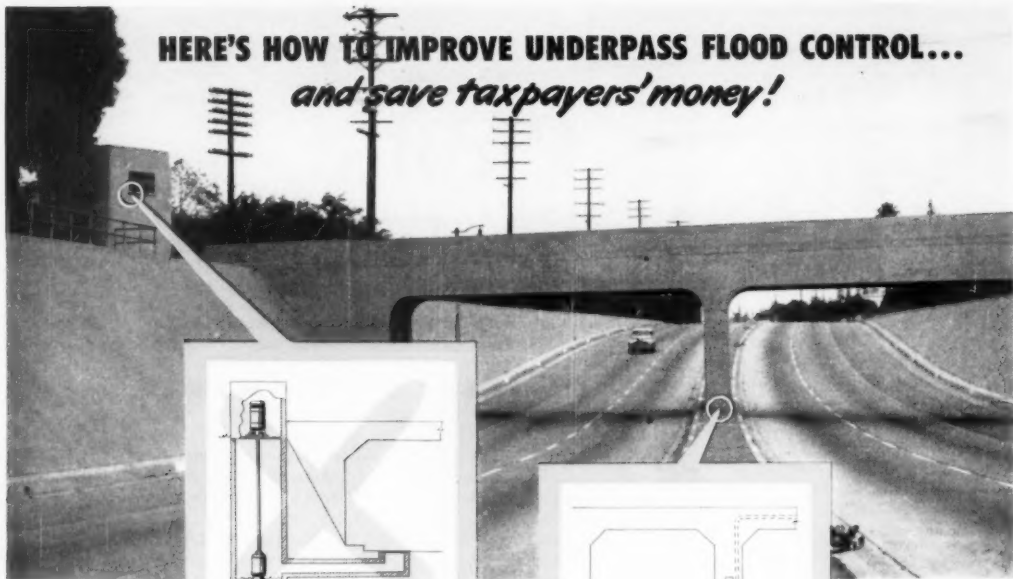
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The 1950 volume of *Public Works* will be available on microfilm through University Microfilms, 313 N. First St., Ann Arbor, Mich.

**HERE'S HOW TO IMPROVE UNDERPASS FLOOD CONTROL...**  
*and save taxpayers' money!*



# BJ

## SUBMERSIBLE PUMPS

**save space, reduce installation cost,  
and eliminate the expensive pump house eyesore**

MELTING SNOW, heavy rains, and general water drainage are big problems in underpass flood control planning. This photo shows how you can meet these troublesome flood demands with new efficiency and at far less construction cost. The old standard pump house installation (at left), expensive and unattractive, can be replaced by unseen yet easily accessible BJ

Submersible Pumps. These pumps are placed in a simply-constructed pit between highway lanes. They provide all the pumping capacity you need, yet use less than 1/10th the space required by a standard pump installation.

Plan your new underpass construction with BJ Submersible Pumps. And keep these space-saving pumps in your general water supply and water control program. For full details, specifications and capacities, contact your local BJ representative or send the coupon below.

**BJ PUMP DIVISION, Dept. 51**

Please send me full details on the BJ Submersible, including data on actual municipal installations.

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DEPT. \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

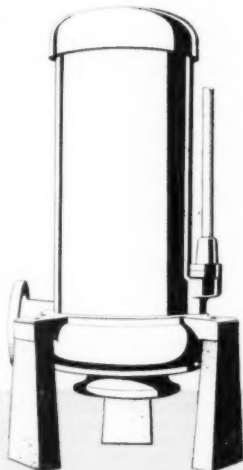
No obligation, of course

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Since 1872

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LOS ANGELES 54, CALIF.

Offices in Principal Cities



**BJ Underpass Submersible with  
2-port non-clogging runner.**

When you need special information—consult READERS' SERVICE DEPT. on pages 93-97.

# THE EDITOR'S PAGE

## What About That Civil Defense Program?

**L**ONG time no see" is an excellent description of the civil defense program about which we heard so much a year or two ago. Perhaps this needed project is bogged down in some sections in good third class politics. That is probably entirely all right so far as the utilization of the political elements in the program is concerned, but the technical phases of the work need a lot of organization and of sifting, sorting and training of personnel.

The real job is to orient the professional civilian skills to the work of civilian defense. Thousands of engineers can testify that, in their military service, they were rarely called on to do precisely the same work that they had done in civilian life. The skills that they had acquired in years of engineering work were essential in solving war-time problems, but the problems themselves were usually new. It will be the same if a civil defense program is ever needed.

For instance, how many construction engineers have had experience in demolition, wrecking and cleaning up; how many public health engineers in organizing field water points; how many structural engineers in building bridges right now from available materials? Some, of course, but not many. The basic knowledge is there, but the best methods of applying this knowledge to solve the likely problems that will be encountered must be developed.

We see no reason why a professional civil defense program could not be started, leaving political phases of the program for a later time. Using the recently published civil defense program as a basis, an aggressive group composed of various professional skills could show a community a good many things.

## Working Out the Industrial Waste Treatment Problem

**O**NE of the problems connected with industrial waste treatment for stream pollution abatement is: Who is going to furnish the technical know-how for the work? With all of the skill and knowledge at hand in this country, this may sound like a foolish question; but we think it isn't.

Relatively few industries, even the major ones, have engineers skilled in waste treatment. A few have sanitary engineers, but in most cases, unfortunately, the work of these men has been on a relatively low level of responsibility, and far from management; and their design experience has generally been small. No one can expect that plant or maintenance engineers, or company engineering departments, except rarely, have the skills necessary to design an adequate waste disposal plant of any but the simplest type.

If these assumptions are true, it would seem that our consulting engineers are best qualified in every way to solve these problems of industrial waste

treatment. They have the skills and the organization to do the work, and they can do it well. Moreover, they are familiar with the values and uses of modern sewage treatment equipment, which will be needed in most cases.

There is one thing that industry should be careful about. There will be many men without special experience or training, men with pet but untried theories, who will try to sell themselves and their products in this field. Nothing could be more detrimental to the success of the stream pollution abatement program. Adequate skills are available already; it is neither necessary nor desirable to seek panaceas or patent medicines.

## What This Country Needs in the Snow Plow Line

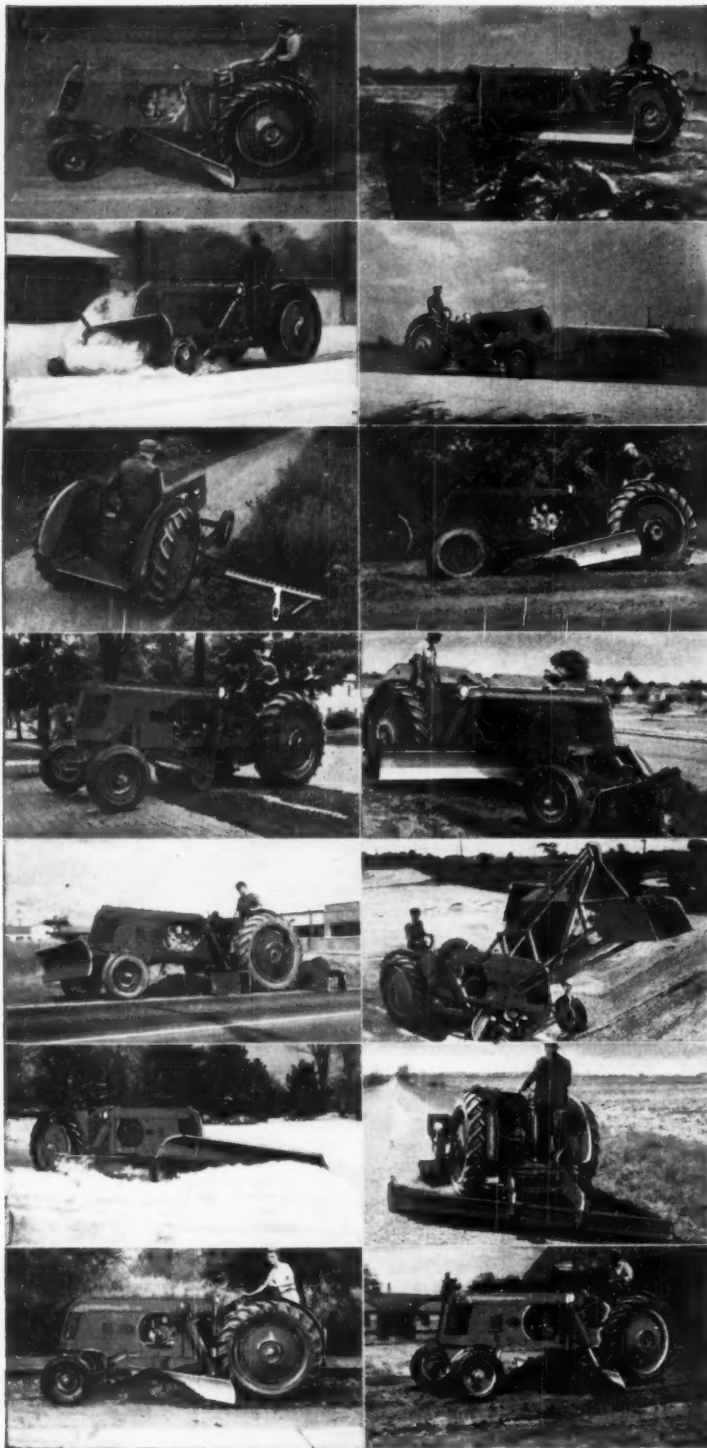
**A**FTER a prolonged consideration of the effects of the late-winter snowfall that blanketed the eastern states, your editor is convinced that one thing this country needs is a snow plow that will automatically avoid piling a big bank of snow in every driveway of every residence. It might be an important public health measure, too, reducing materially the incidence of high blood pressure, apoplexy, backache and sore muscles. And, seriously, it would be a fine piece of public relations, a factor to which too many engineers are insensible.

Lacking this ideal device, there are methods for accomplishing essentially the same ends. Some of our more progressive communities have equipped a wheel tractor with a bulldozer blade. This unit follows along behind the plow and not only opens driveways, but does a lot of clean-up work at intersections where the big plows are handicapped. Sure it costs something, but it saves the citizens more on snow shoveling fees than it costs, and it leaves them suffused with a kindly feeling, totally devoid of any desire to call up city hall in the morning and tell that so-and-so all about it.

## Kind Words for the Engineering Profession

**E**NGINEERS are the least neurotic of all vocational groups according to a recent statement by a director of a Human Relations Institute, who also went on to say that most engineers are shy and need a bit of prodding. Personally, we have always felt that an engineering education was a real asset, over and beyond the technical knowledge acquired. Added to this is the opportunity that the engineer has for getting the priceless experience acquired through contact with those salty and rough, but essential, citizens who do the construction work of the world.

There isn't any short cut to becoming a good engineer, but it is nice to have the psychologists tell us that we start our hard career with some slight advantages over other groups.



## Some of the MORE

### Does Many Jobs .... BIG JOBS

The HUBER Maintainer costs only ONE-THIRD the price of a big motor grader, yet it does ALL of your grader maintenance work.

It outperforms many machines that are larger, heavier, more costly, slower, more expensive to operate, more limited in use. For proof of these statements, see a demonstration.

The HUBER Maintainer is backed by a dozen years of experience in the field on federal, state, county, municipal, township, airport, cemetery, industrial and contract work.

It does all of grader maintenance work . . .

### PLUS

. . . these important jobs, with attachments:

- BERM LEVELING
- ROAD PLANING
- BULLDOZING
- LIFT LOADING
- SNOW PLOWING
- HIGHWAY MOWING
- BROOM WORK
- PATCH ROLLING

**HUBER**  
Marion,

# reasons a **HUBER** gives you **WORK for your MONEY!**

## MANY FEATURES

**42½ H. P.**—More power than many graders. More power, by far, than in ordinary maintainers. Plenty of reserve for the toughest jobs.

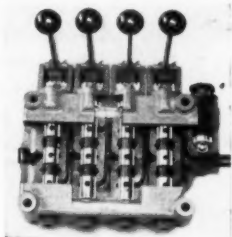
**OVER 6,000 LBS.**—The HUBER Maintainer weighs over 6000 lbs. with solution in the rear tires. Enough weight for most grader requirements . . . enough for all maintenance work.

**BLADE IS PUSHED**—Owners credit HUBER's blade-pushing design for a **THIRD MORE WORK** than conventional pulled blades would produce. Power is transmitted directly from the driving wheels to the moldboard.

**COMPARE** the HUBER with ANY grader or maintainer on the basis of horsepower, cost, proven dependability, versatility and long range economy.

## HYDRAULIC CONTROLS

These hydraulic valves control the raising, lowering and ANGLING of the blade and ALL MOVEMENTS of the versatile attachments. Conveniently grouped finger-tip controls are smooth operating and quick acting. Special steel tubing is used to convey oil to cylinders except at points where the flexibility of hose is required.



### Makes Budgets Go Farther

The HUBER Maintainer is easy on budgets, both in the initial cost and in operating costs. You can buy TWO HUBER Maintainers and pay their operating expenses for a year for the price of one large motor grader.

There's a HUBER Distributor near you—Call him today or write to the factory.

## Some of the jobs **HUBER**

### Maintainers are doing

**GOVERNMENTS**—Care of highways, secondary roads and lands in national parks, reservations, etc.

**STATES**—Many kinds of highway grading and maintenance work.

**COUNTIES**—Every-month care of highways and secondary roads.

**MUNICIPALITIES**—Street and alley grading and maintenance, care of parks, dumping grounds, etc.

**TOWNSHIPS**—The all-around grading and maintenance machine for township roads.

**PUBLIC GROUNDS**—Care of parks, playgrounds, conservation areas, public beaches, etc.

**OILFIELDS**—Grading and maintaining roads; building dams around oil wells and storage areas.

**CEMETERIES**—Every-month care of drives, mowing, developing new grounds, snow removal, patching, etc.

**AIRPORTS**—Grading unpaved areas, patching pavement, mowing, snow removal by plow or broom, towing, etc.

**LOGGING**—Grading and maintaining logging roads and grounds.

**INDUSTRIES**—Care of industrial roadways and grounds.

**MINES**—Care of roadways; sweeping coal veins before removal.

**ESTATES, RANCHES**—Care of roadways and grounds.

**RACE TRACKS**—Care of tracks and surrounding grounds.

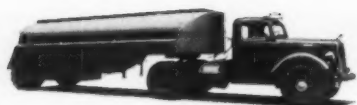
**CONTRACTORS**—Performs many different jobs in all kinds of contract work.

**MFG. CO.**  
Ohio

Manufacturers of HUBER Maintainers, HUBER Tandem and 3-Wheel Rollers and HUBER Graders

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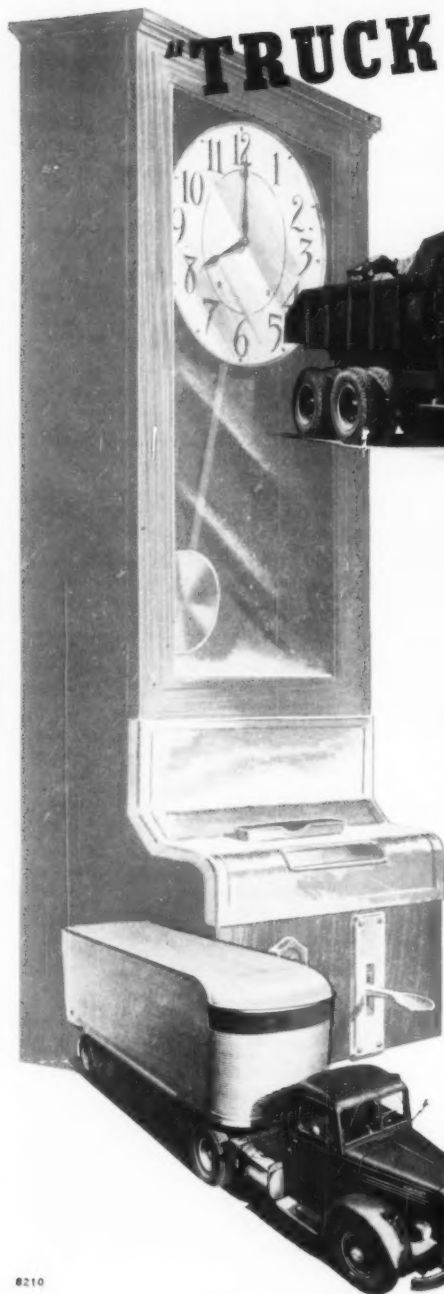




...Cut Down

# "TRUCK ABSENTEEISM"

put MACK TRUCKS on  
your job



"Truck Absenteeism," like its human counterpart, disrupts the efficiency of your business . . . adds materially to your costs.

Actual job records prove that with Mack trucks on the job "truck absenteeism" is reduced to an absolute minimum. That's because Mack trucks have built-in durability . . . extra reserves of strength and stamina. Because they're better built, they're better able to stand up to the demands of hard-working, day-in, day-out service.

Work done on the job will always be the one true yardstick of truck value. Figured that way, every Mack truck gives full measure — and more — in round-the-clock dependability;

- longer, more trouble-free mileage life; sustained earning power; and rock-bottom maintenance costs.

On the job — and on the job records — it proves out every time: "YOU GET MORE WORK OUT OF MACK TRUCKS, BECAUSE MORE WORK GOES INTO MACK TRUCKS."

Be Profit-Wise

**Modernize with**



Mack Trucks, Inc., Empire State Building, New York 1,  
New York. Factories at Allentown, Pa.; Plainfield, N. J.;  
New Brunswick, N. J.; Long Island City, N. Y. Factory  
branches and distributors in all principal cities for  
service and parts. In Canada: Mack Trucks of Canada, Ltd.

# 88-H .. 99-H .. MASTER "99"

## The Power Graders That Have Everything

- |                       |                               |
|-----------------------|-------------------------------|
| ✓ All-Wheel Drive     | ✓ High-Lift Blade             |
| ✓ All-Wheel Steer     | ✓ Extreme Blade Reach         |
| ✓ Precision Sideshift | ✓ Completely Reversible Blade |
| ✓ Controlled Traction | ✓ Full Hydraulic Control      |



**1950 13th**  
**In ~~1949~~ for the ~~12th~~ Consecutive Year**

no other graders will perform so many construction and maintenance jobs so well. Your nearby Austin-Western distributor will be glad to tell you the whole story.

**AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U. S. A.**

BUILDERS OF ROAD MACHINERY  
**Austin Western**  
SINCE 1889

When writing, we will appreciate your mentioning PUBLIC WORKS



Without beam strength—or, for that matter—without all of the strength factors listed opposite—no pipe laid 100 years ago in city streets would be in service today.

But, in spite of the evolution of traffic from horse-drawn vehicles to heavy trucks and buses—and today's vast complexity of subway and underground utility services—cast iron gas and water mains, laid over a century ago, are serving in the streets of more than 30 cities in the United States and Canada.

Such service records prove that cast iron pipe combines all the strength factors of long life with ample margins of safety.

No pipe that is provably deficient in any of these strength factors should ever be laid in city streets. Cast Iron Pipe Research Association,  
Thos. F. Wolfe, Engineer, 122 So. Michigan Ave., Chicago 3.

# CAST IRON PIPE

When you need special information—consult READERS' SERVICE DEPT. on pages 93-97.

# Strength factors of Long Life !

*No pipe that is provably deficient in any of these strength factors should ever be laid in city streets*

## BEAM STRENGTH



When cast iron pipe is subjected to beam stress caused by soil settlement, or disturbance of soil by other utilities, or resting on an obstruction, tests prove that standard 6-inch cast iron pipe in 10-foot span sustains a load of 15,000 lbs.

## CRUSHING STRENGTH



The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

## SHOCK STRENGTH



The toughness of cast iron pipe which enables it to withstand impact and traffic shocks, as well as the hazards in handling, is demonstrated by the Impact Test. While under hydrostatic pressure and the heavy blows from a 50 pound hammer, standard 6-inch cast iron pipe does not crack until the hammer is dropped 6 times on the same spot from progressively increased heights of 6 inches.

## BURSTING STRENGTH



In full length bursting tests standard 6-inch cast iron pipe withstands more than 2500 lbs. per square inch internal hydrostatic pressure, which proves ample ability to resist water-hammer or unusual working pressures.



# SERVES FOR CENTURIES

When writing, we will appreciate your mentioning PUBLIC WORKS

# GREAT GRADERS

THEY'RE not guessing about the performance of "Cat" Diesel Motor Graders in the Bayfield County Highway Department, Washburn, Wisconsin. They know from experience these husky yellow machines do a whale of a job at a minimum of cost to taxpayers. And that's not exactly easy in this northern county. Average annual snowfall exceeds 100 inches. Severe weather changes are rough on roads. It takes machines with guts to keep them up and open all year round.

Here you see two of the county's 9 "Cat" Diesel No. 12 Motor Graders which black-topped 14 miles of 28-ft. road on State Highway No. 63 at the rate of one mile per hour. When winter comes, you'll find them busy plowing snow. But let's get the over-all picture directly from High-

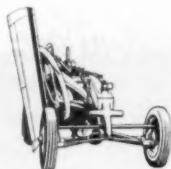
way Commissioner Harry B. Curry, who says: "Up here our black-top season is short. We must put in as many hours as possible mixing and spreading. We use from 5 to 8 'Cat' Graders for the road mix, and generally two machines for putting down the mat. We have been 100% 'Caterpillar' for many years—some of our No. 11s date back to 1935 and still are doing a real job. 'Caterpillar' builds great machines. We are thoroughly sold on their dependability."

Whatever the grading job, there's a "Cat" Diesel Motor Grader the right size for it—and a responsible "Caterpillar" dealer nearby for round-the-clock service. Your "Caterpillar" dealer believes sincerely this grader is the best in the field. Ask him for proof of performance!

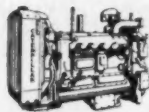
CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS



Only "Caterpillar" designs and builds every part of the famous "Cat" Motor Graders. This undivided responsibility is your assurance of a long life of efficient, economical performance.



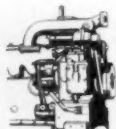
Each of the 3 sizes of "Cat" Motor Graders is a completely different machine. There's no performance penalty due to excessive frame weight, too little power or poorly matched working parts.



Only "Caterpillar" Motor Graders have the dependable yellow engines—the power plants that are world famous for delivering 60-minute-hour performance every hour day in and day out.



Lubricating oil is cooled in this radiator section to minimize carbon lacquer and gum formations—enemies of long engine life. Lower temperatures preserve the lubricating qualities of the oil.



Safe and sure Diesel starts are assured by this electrically started gasoline engine. It warms the coolant and allows the Diesel to circulate "lube" oil before actual starting.



Castings like this cylinder head on "Cat" Diesels are made right in "Caterpillar's" own foundry, where tolerances and quality can be closely controlled—another example of precision engineering!

# CATERPILLAR

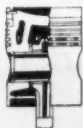
REG. U. S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS



...and here's  
the proof!

Two of the "Cat" Diesel No. 12 Motor Graders owned by the Bayfield County Highway Department, Washburn, Wisconsin. Other big yellow machines in this county's fleet include two No. 11 Motor Graders, four D8 Tractors and two D7 Tractors.



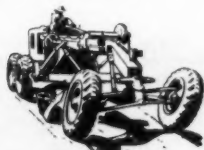
Typical of "Caterpillar" quality are these aluminum alloy pistons. Tops are oil sprayed for coolness and long life. Cast iron compression-ring belt keeps this vital ring working at top efficiency.



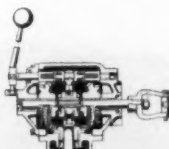
"Caterpillar"-built fuel injection equipment is trouble-free and fool-proof. Injection capsules and pumps can be replaced on the spot in the field — no adjustments are necessary.



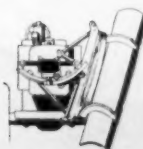
Exclusively "Caterpillar," these solid aluminum "con" rod bearings give low rate of wear, ability to carry heavier loads, exceptional heat transfer characteristics and high corrosion resistance.



"Caterpillar" Motor Graders are designed for exceptionally good operator visibility. Sitting down, the operator can see toe and heel of the blade with equal ease. That helps keep jobs moving.



Mechanically operated controls give the user the constant control that is so necessary for precision work. They're quality built — changes in temperature do not affect them.



"Caterpillar's" exclusive side-shift mechanism allows extreme blade positions without the need for manual adjustment of linkage. You'll find this a real work- and time-saver on the job.

# DIESEL

EARTHMOVING EQUIPMENT

Ask your dealer for a demonstration!  
Ask him for a showing of the new  
film, "Better Blading"!

**SUPERIOR IN EVERY WAY  
DESIGNED TO PROVIDE ALL PRACTICAL  
SHAPES QUICKLY AND EASILY**

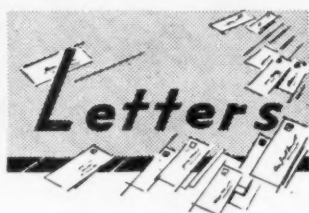
**Heltzel**  
**BUILDS IT BETTER**

Compare Heltzel forms with any other make... the most rigid, the most completely engineered equipment obtainable... straight, radius, flexible and serpentine curbs and gutters and sidewalks are formed swiftly and economically with the barest minimum of labor where Heltzel forms are used. Let us send you complete information, including illustrations of the Heltzel line—ASK FOR BULLETIN A-20-G.

**SHAPES,  
STANDARD  
OR SPECIAL,  
ARE EASILY MADE  
FROM HELTZEL STEEL FORMS**

**HELTZEL** STEEL FORM & IRON CO.  
WARREN, OHIO • U. S. A.

When you need special information—consult READERS' SERVICE DEPT. on pages 93-97.



### TECHNICAL JOURNALS HELP

There was a striking response to notices, carried by the technical journals, of the Inservice Training Course in Air Pollution of the School of Public Health of the University of Michigan. The registered attendance was 246, whereas a hundred were expected; 45.4 were from outside Michigan, including 24 states and Canada; more than half of the registrations received were from persons who said their interest originated from a notice in one of the technical magazines. Most of these requested registration on the basis of the information carried in the magazine alone.

Thank you for your interest in the Air Pollution Course and for any notation you may care to make of our forthcoming course in Industrial Hygiene and Human Relations for Safety Personnel.

H. E. Miller,  
*Resident Lecturer in Public Health Engineering, University of Michigan.*

### GRAVEL ROAD MAINTENANCE

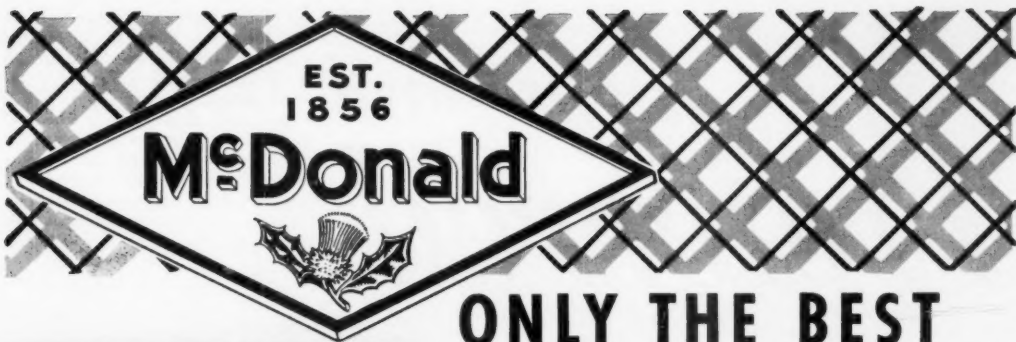
I would like to have information in plain language, with suitable diagrams, if possible, on the best methods of maintaining gravel roads with motor graders. I wish these to use in instructing the operators how to save gravel, maintain the crown and prevent starting an additional ditch on the shoulders.

C. R. Melton,  
*County Hwy. Supt.,  
Havana, Ill.*

(Will our readers who have developed standard operating practices for gravel road maintenance forward copies to Mr. Melton, and also to PUBLIC WORKS?)

### SEWERAGE EQUIPMENT

I notice that a new Sewerage Manual is available. . . . We are contemplating the purchase of power sewer cleaning apparatus and I am looking for a list of manufactur-



## ONLY THE BEST

### IS A TRADITION WITH McDONALD

Old time craftsmanship combines with modern manufacturing methods to produce the finest in waterworks brass at McDonald's. Every item is individually tested to meet quality demands of the most exacting customers. When you specify McDonald, you specify the best.

Representing over 100 years of service in the A.Y. McDonald Mfg. Co. organization—George W. Avery, foreman, and Frank Otto, oldest employee in the Ground Key department.



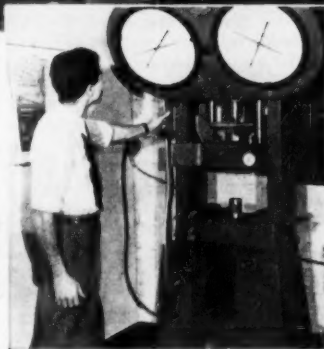
↓ Overhead conveyor and dispenser of molding sand to the individual mold in the new foundry building.



↑ Pouring brass into molds. Pourers are equipped at all times with safety equipment for accident prevention.



Riley Tensile Strength machine for testing capacity in the laboratory. Testing is conducted daily.



**A. Y. McDONALD MFG. CO.**

DUBUQUE, IOWA

BRASS GOODS • PUMPS • OIL EQUIPMENT

When writing, we will appreciate your mentioning PUBLIC WORKS

# Preferred



*air-cooled* **POWER**

... There are more Briggs & Stratton air-cooled gasoline engines in service — on farm equipment, industrial machines, tools, and appliances — than all other makes of gasoline engines in their field combined.

No other single-cylinder, 4-cycle, air-cooled engines are so universally preferred by manufacturers, dealers and users alike.

No other engines in their class can match Briggs & Stratton in engineering precision — in dependable performance — long life — service.

**BRIGGS & STRATTON CORPORATION**  
Milwaukee 1, Wis., U. S. A.



When you need special information—consult READERS' SERVICE DEPT. on pages 93-97.

ers of this equipment. Due to moving, the latest copy of the Manual I have is 1947-48; can you furnish me an up-to-date copy and a list of manufacturers?

Am also interested in the per capita cost of a sewage treatment plant (package type) for a community of 100 families. Is there any source which gives the cost per capita for such plants, similarly to a unit cost in house construction?

N. W. Nester,  
Civil Engineer,  
Urbana, Ill.

## VERTICAL SAND DRAINS

I am interested in obtaining information on the methods employed in California to install vertical sand drains. According to the Engineering Index, this subject was covered by T. E. Stanton in the May, 1948, issue of your magazine. Would you send me a copy of that issue? Also, I would appreciate any additional information or references to further sources.

Donald R. Goodkind,  
147 Halstead St.,  
East Orange, N. J.

## SUBSURFACE EXPLORATION

This office is exploring the possibility of building or purchasing a test boring rig suitable for mounting on a light truck or trailer. Can you refer us to articles or sources covering costs, materials and design information.

Arthur F. Jonas,  
Senior Civil Engineer,  
Department of Public Works,  
New Rochelle, N. Y.

(PUBLIC WORKS will be glad to have a copy of any information sent to Mr. Jonas.)

## WITH REGRET

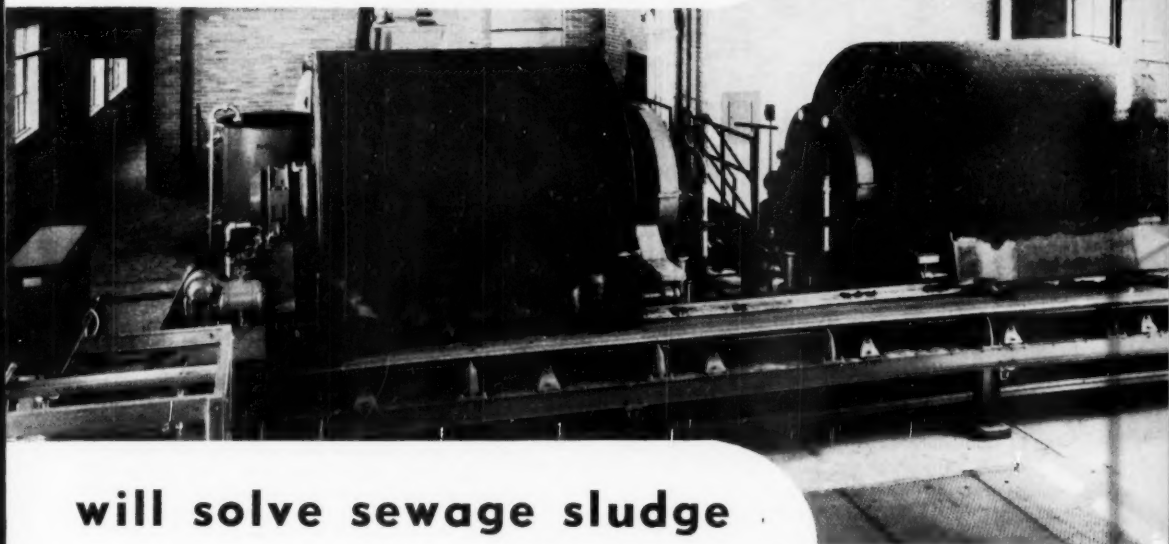
After having been a continuous subscriber to your magazine for 50 years, I am reluctantly asking you to discontinue sending it to me. The benefits received from its many valuable presentations over the years are pleasant memories. You will have my best wishes for deserved success.

Andrew J. Provost, Jr.,  
Darien, Conn.

(Ed. Note: We congratulate Mr. Provost on his long and outstanding career in engineering, and we regret that he is no longer active in this field to which he has contributed so greatly.)



# An EIMCO Installation



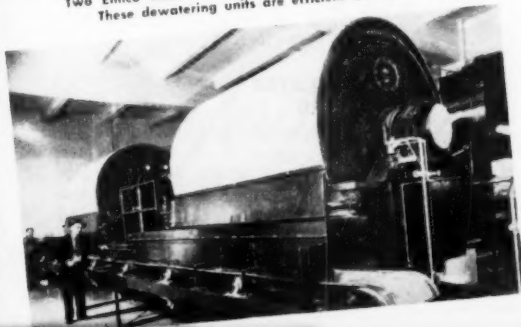
will solve sewage sludge  
dewatering problems



Two Eimco Installations in Prominent Mid-Western Cities.  
These dewatering units are efficient and sanitary.

Eimco installations from Connecticut to California—from Washington to Florida have solved countless sewage sludge dewatering problems. The designers, consulting engineers, and contractors prefer Eimco equipment because Eimco guarantees the performance of its equipment, and relieves the prime contractor of that responsibility. New methods of sewage treatment include Eimco equipment for sludge dewatering because of its heavier construction and more dependable operation. Don't be satisfied with just vacuum filtration — specify Eimco Continuous Vacuum Filters.

Write for bulletins on Eimco Installations.



**EIMCO**  
THE EIMCO CORPORATION  
*The World's Largest Manufacturer of Dewatering and Sludge Handling Machines*  
EXECUTIVE OFFICES AND FACTORIES — SALT LAKE CITY 8, UTAH, U.S.A.  
BRANCHES: NEW YORK, CHICAGO, BIRMINGHAM, EL PASO, BERKELEY, DULUTH  
AFFILIATED COMPANIES: SOCIÉTÉ EIMCO, PARIS, FRANCE  
EIMCO (GREAT BRITAIN) LTD., LONDON, ENGLAND  
AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD





## FRESH OUT OF AIR, SIR?

**Call on R-C dual-ability to move air or gas in any quantities for industrial uses**

When you have a job of handling gas or air, in quantities from 5 cfm to 100,000 cfm, Roots-Connersville will do it efficiently and economically. With many sizes and types, we can match blowers, exhausters and gas pumps closely to the job, to reduce first cost and operating costs.

R-C dual-ability offers you the exclusive, dual choice between Centrifugal and Rotary Positive designs. You can select single-stage or multi-stage units, from our standard lines, with flexibility as to drives and other accessories to meet your needs.

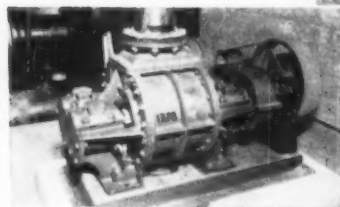
To aid in your specifications, our air-and-gas specialists are at your service. With nearly a century of experience behind them, they can help you solve almost any problem of handling air or gas.

### ROOTS-CONNERSVILLE BLOWER CORPORATION

504 Poplar Avenue, Connersville, Indiana



Three Centrifugal Blowers in large eastern sewage treatment works. Capacity 15,000 cfm each.



Rotary Positive Blower used in water filtration application. Capacity 470 cfm.

**ROTARY**

# Roots-Connersville

ONE OF THE DRESSER INDUSTRIES



## BOOKS IN BRIEF

### RIGID FRAME BRIDGES

The new third edition of this excellent book presents a greatly simplified method of analysis for skewed frame bridges. Design of the single span skewed frame bridge is now about as easy as design of the unskewed structure, and the double-span design has also been made easier. There are many other changes for the better in this text. Type size is convenient for reading; most of the drawings and charts are clear. Many illustrations: 240 pages. Authors are Arthur G. Hayden and Maurice Barron. Published by John Wiley & Sons, Inc., New York. \$5.

### INDUSTRIAL WATER

Standard ASTM methods for sampling, analysis and testing of industrial waters are brought together in this text. Reference is mainly to steam, process and cooling waters; 26 methods of analysis and methods of reporting are given. 142 pp. ASTM, 1916 Race St., Philadelphia 3, Pa. \$1.75.

### BRIDGE FLOORING

The data in this folder, even though it contains only 4 pages, will be helpful. It shows and gives data on a strong, lightweight corrugated sheet steel flooring for bituminous surfaced roadways on bridges, viaducts, overpasses, etc. United Steel Fabricators, Inc., Wooster, Ohio.

### SAFETY EQUIPMENT

This is a catalog "Everything in Safety" which covers protective equipment and industrial safety devices—respiratory, eye protection, hats, gloves, carboy pumps, drum pumps and much other equipment. General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa.

### INSULATED PIPING

Construction and installation of various types of Ric-Wil insulated piping, with much technical data and specifications on piping systems and pipes. Ask for Section 480-4 and Section 480-5. Ric-Wil Co., Commerce Bldg., Cleveland, Ohio.

# FOOD WASTE DISPOSERS

Let's look at them  
from the User's  
Viewpoint!

In many communities . . . in thousands of homes . . . freedom from disease-breeding garbage is an accomplished fact—thanks to forward-thinking, health-minded city officials!

WHEN PLUMBING first came indoors, sewage facilities didn't exist . . . and zoning codes made no provisions for plumbing.

Forward-thinking officials took the lead in creating vast municipal sewage systems. They recognized the need—helped improve the health, comfort, and convenience in their communities by insisting on measures that would help speed the swing to full, modern sanitation.

## You can complete the job

Now, the health-minded city official has an opportunity to help complete this sanitation cycle. The food waste disposer is *here*—accepted, wanted, needed. You'll earn the thanks of your community by encouraging the *community-wide* abolition of garbage.

From your own viewpoint, and from the viewpoint of the public, consider these obvious points of superiority of the Youngstown Kitchens Food Waste Disposer:

## LOOK FOR THESE THREE VITAL FEATURES

- 1 Food waste can be fed in *continuously*. No waiting for a load to be shredded and flushed with the Youngstown Disposer.
- 2 The rotary shredder turns in the *opposite direction* every time the switch is turned on. This doubles the life of the Youngstown Disposer's cutting edges—keeps shredders sharp enough to take even small bones easily!
- 3 Waste is shredded thoroughly—the tiny particles actually act as a cleansing agent! The Youngstown Disposer's automatic reversal of rotary shredder changes the direction of water swirl, for *complete self-flushing*. Super-hard, chrome-plated steel shredders stay sharp and bright.

MULLINS MANUFACTURING CORPORATION • WARREN, OHIO  
World's Largest Makers of Steel Kitchens



*Youngstown Kitchens*

**FOOD WASTE DISPOSER**

The public wants and needs this automatic, sanitary food waste disposal. Let's make the healthy, garbage-less community a reality as quickly as possible!

## A NECESSITY FOR EVERY MUNICIPALITY



### Simple • Positive Powerful

### PNEUMATIC BUCKETS

Two types of Netco Buckets are available with large capacity: (1) An orange peel type which operates through an opening as small as 16 inches. (2) a clamshell designed to operate through rectangular frames as small as 13 1/2" x 19".



These Cities and Many Others Own  
One or More  
Netco Catch Basin Cleaners

Boston, Mass.  
New York City, N. Y.  
Indianapolis, Ind.  
New Brunswick, N. J.  
Harrison, N. J.

East Cleveland, Ohio  
Binghamton, N. Y.  
Chicago, Ill.  
Philadelphia, Pa.  
Niles, Ohio

### Check these features

- The Netco Catch Basin Cleaner can be mounted on any short wheel base truck having at least 8 ft. in back of cab. You can purchase unit separately and mount on your own chassis.
- The Netco Unit can be removed from truck and chassis in 30 minutes.
- The Netco can be operated continuously because the material removed from catch basins is loaded into other trucks. This unit will average 20 to 30 catch basins per 8 hour day.
- The Netco Bucket closes pneumatically, assuring positive and maximum digging efficiency.
- Positive and simple control of pneumatic bucket, boom swing, hoist clutch and boom brake by compressed air.
- The Bucket is lowered and raised by one cable. Only one hose is required to close it, and it is opened by powerful spring action.
- The Netco has a hoisting capacity up to 1500 lbs.



## NETCO DIVISION

CLARK-WILCOX COMPANY  
118 Western Avenue  
Boston 34, Massachusetts



When you need special information—consult READERS' SERVICE DEPT. on pages 93-97.

## CIVIL ENGINEERING BIBLIOGRAPHY

A selected bibliography of civil engineering subjects listing more than 225 titles grouped under 8 headings has been published by the Engineers' Council for Professional Development, New York, N. Y. It covers Geology; Handbooks; Hydraulic and Water Power Engineering; Materials, Costs, Contracts and Reports; Sanitary Engineering; Structural Engineering; Surveying and Geodesy; and Transportation. The price is 25¢.

## DIESEL QUIZ

Simple and easy-to-understand answers to 17 basic questions about the design and operation of diesel engines, with special reference to General Motors engines. Small folder. Sent on request to Detroit Diesel Engine Division, 13400 W. Outer Drive, Detroit 28, Mich.

## WATER SUPPLY GEOLOGY

The eleven chapters in this book include: Rainfall, geological considerations, geographical aspects, stability of hillsides, surface water supplies, underground water, engineering works, and quality of water. 209 pp.; ill. By C. S. Fox. The Sherwood Press, Washington 13, D. C. \$6.

## HIGHWAY CAPACITY

This valuable and excellent text contains reports on detailed studies of various roadway and traffic conditions, with their effects on the flow of vehicles; roadway capacities; the effect of intersections, parking, and other factors. Some of the data in this text have been used in recent articles in PUBLIC WORKS. The title is "Highway Capacity Manual." It was prepared by O. K. Norman and W. P. Walker. 147 pages; on sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 65 cents.

## SNOW & ICE CONTROL

A report of a 2-year study by a committee of the American Public Works Association on snow and ice control with special reference to cities of less than 200,000 population. Price \$2. Order from American Public Works Ass'n., 1313 East 60th St., Chicago 37, Ill.



## Baltimore Cleans-up Its Market Areas

### DEMPSTER-DUMPSTER SYSTEM SOLVES BULK REFUSE PROBLEM

Garbage and rubbish disposal in Baltimore's market areas, which was becoming a sanitation problem and for years defied solution, has now been solved by the Dempster System of bulk rubbish collection. Baltimore Bureau of Sanitation officials agree that results have been outstanding and a definite economy has been realized.

Dempster-Dumpster containers, of 10 cu. yd. capacity, have been placed at key points where garbage, litter, discarded produce and rubbish are deposited immediately as they accumulate. When the doors to the fireproof container are closed, no rats can reach the refuse . . . no flies can contaminate it . . . no wind, scavengers or domestic animals can scatter it. As each container is filled it is picked up, hauled away, dumped at the disposal area and returned to the market by a Dempster-Dumpster truck hoisting unit. One hoisting unit services a large number of these containers.

The Dempster-Dumpster principle—quick pick-up of pre-loaded containers—can be applied not only in market places, but wherever bulk refuse accumulates . . . such as hospitals, apartment houses, schools . . . and at tremendous savings for any city. Write today for the complete Baltimore story.



940 DEMPSTER BLDG.

*Photos show one of the first Dempster-Dumpster units at work in Baltimore. The conveniences of the Dempster-Dumpster System have encouraged citizens to take a personal interest in public sanitation, and have made it easy for them to keep the market areas clean.*

KNOXVILLE 17, TENN.



When writing, we will appreciate your mentioning PUBLIC WORKS



**"Boy!  
Was that Commissioner  
impressed!"**

"Said he didn't think it was possible to raise a gate so easy. Seems that in his town's plant they're forever having trouble with gates sticking and stems breaking. No wonder. On some of his gates there's forty tons' pressure pushing a rusty gate against rusty facing strips. That's friction you just can't beat.

"I told him our Everdur\* equipment won't stick because it never rusts. When he said they can't afford to use Everdur, I told him he can't afford *not* to. Proved it, too! Showed him that the little extra it cost was only a fraction of what they were spending on replacements . . . replacements they'd never have had to make if they'd used Everdur in the first place. The Commissioner said he guessed I was right.

"Smart man, that Commissioner."

\*Reg. U. S. Pat. Off.

49171

Corrosion is the enemy you can lick by fabricating your equipment with Everdur... Anaconda's Copper-Silicon Alloys. Everdur combines the corrosion resistance of copper with high tensile strength. It's available in all wrought commercial shapes; also in casting ingots. It is easy to weld and easy to fabricate.

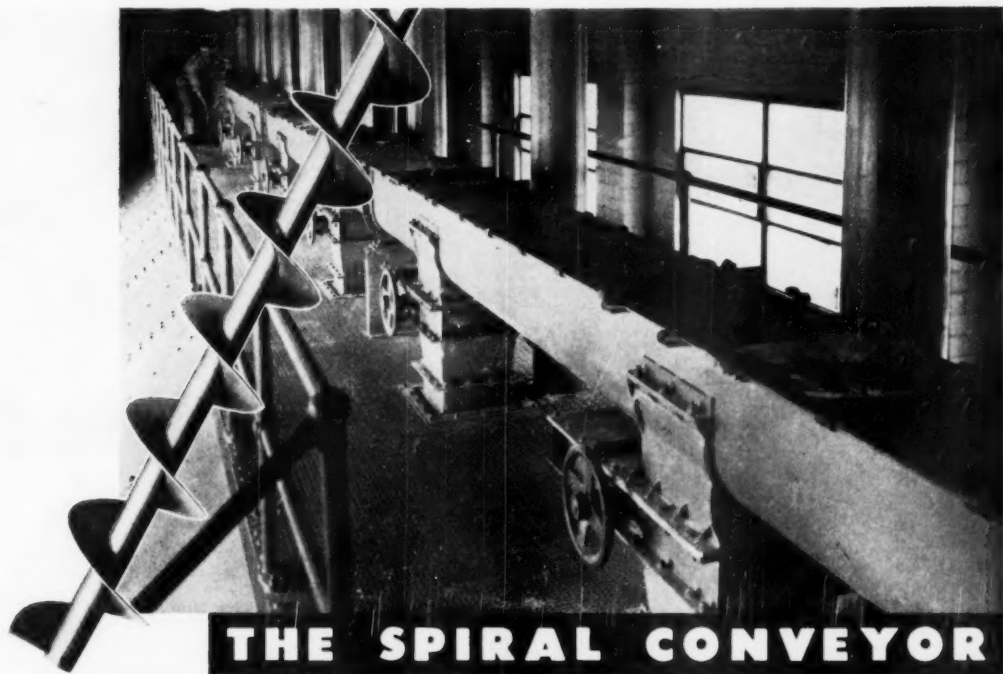
May we send you more information on Everdur? Do you have a problem on which we can give you technical counsel? Just write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

Where corrosion resistance counts—use Everdur . . .

**ANACONDA**  
**COPPER-SILICON ALLOYS**

When you need special information—consult READERS' SERVICE DEPT. on pages 93-97.





Jeffrey Spiral Conveyor handling alum and lime in a large Water Works Plant. A section of Spiral flight is also shown.

Sludge Collectors  
Sludge Elevators  
Grit Washers & Collectors  
Flocculation Equipment  
Bar Screens  
Spiral Conveyors  
Chains — Bearings  
Grinders

## THE SPIRAL CONVEYOR

### A COMPACT INSTALLATION

Used extensively in Water Works Plants for handling lime, alum or other chemicals—saving time and cost. Jeffrey Spirals make compact installations—can be made dust-tight. No return strand. Capacities vary with size of unit.

Photo above shows a Jeffrey Spiral installation in a large Ohio Water Works Plant. Note the clamped cover used when handling dusty material—also the various rack and pinion valves in the trough bottom for delivery of material when and where needed.

Catalog No. 803-A fully describes and pictures Jeffrey Spirals. Catalog No. 775-A covers our complete line of Sewage, Water and Industrial Waste Treatment equipment.

# THE JEFFREY

**MANUFACTURING COMPANY** Established 1877

947 North Fourth St., Columbus 16, Ohio

Baltimore 2  
Birmingham 3  
Boston 16  
Buffalo 2

Chicago 1  
Cincinnati 2  
Cleveland 13  
Denver 2

Detroit 13  
Harlan  
Houston 2  
Huntington 19

Jacksonville 2  
Milwaukee 2  
New York 7  
Philadelphia 3

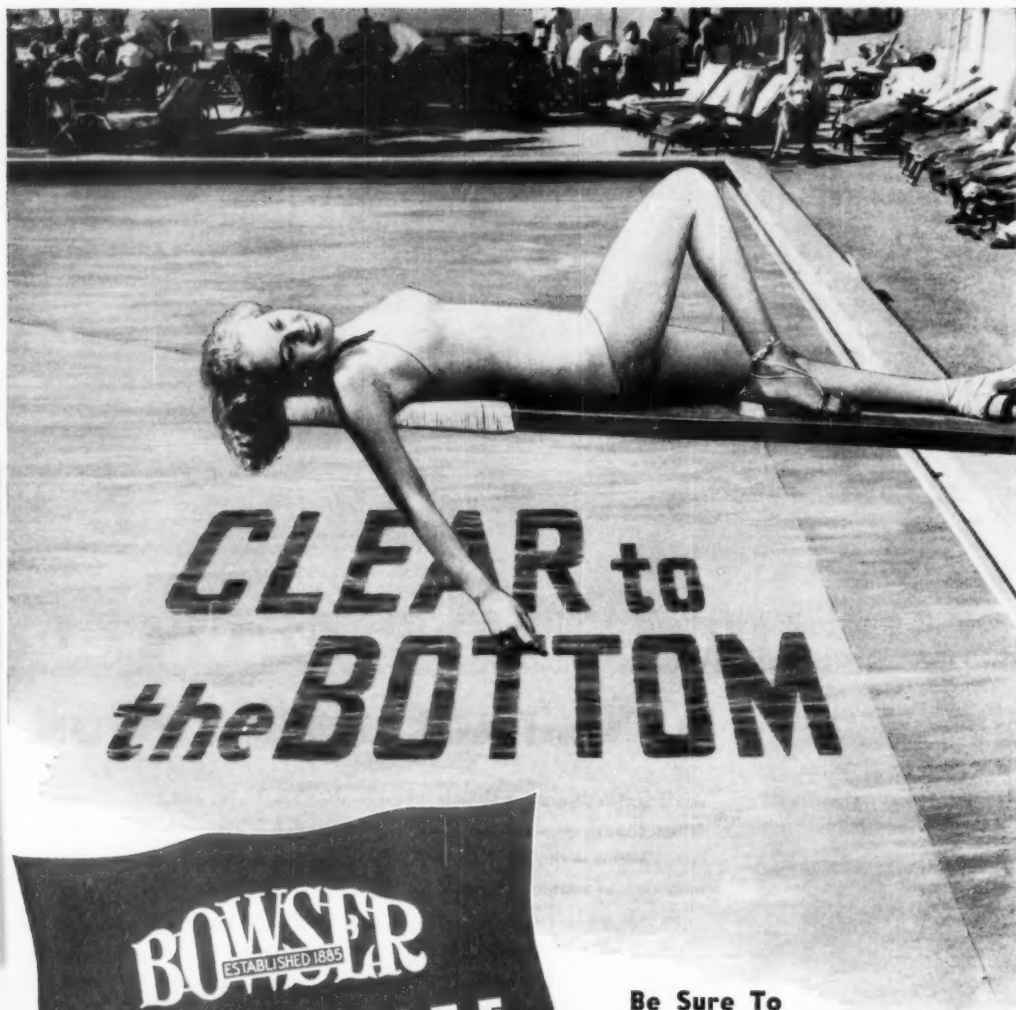
Pittsburgh 22  
St. Louis 1  
Salt Lake City 1  
Scranton 3

Complete Line of  
Material Handling,  
Processing and  
Mining Equipment



Jeffrey Mfg. Co., Ltd., Head Office & Works, Montreal

When writing, we will appreciate your mentioning PUBLIC WORKS



**BOWSER**  
ESTABLISHED 1885  
**DIATOMITE  
FILTRATION**

**Be Sure To  
Get the Facts**

... on modern Bowser filters for  
your swimming pools.

Most swimming pool authorities  
choose Bowser filters for:

- 1. CRYSTAL CLEAR WATER**
- 2. LOWER OPERATING COSTS**

*Write today for a FREE copy of the Bowser booklet*

*"The MODERN way to filter swimming pool water."*

**BOWSER, INC., 1395 Creighton Avenue, Fort Wayne 2, Indiana**

**LIQUID CONTROL SPECIALISTS SINCE 1885**

*When you need special information—consult READERS' SERVICE DEPT. on pages 93-97.*

## A quick rescue for drowning subgrades



Water-logged subgrades soon lose their stability, become poor foundations for expensive surface installations. But Armco Perforated Pipe provides a quick, low-cost way to get rid of harmful ground water.

Long, lightweight lengths of Armco Pipe go in fast. A few unskilled men do the job with hand tools and labor costs are low. Simple bolted coupling bands make strong, tight joints. You save time and money.

Armco Perforated Pipe assures dependable, efficient service. It has proved strength to resist crushing or cracking under heavy loads, impact and vibration. There is no danger of disjointing or loss of alignment. Clogging is no problem. The scientifically placed perforations admit water freely yet exclude backfill material.

Use Armco Perforated Pipe for installing complete subdrainage systems or for correcting trouble whenever it occurs under city streets, highways, airports, parks, and similar areas. You'll save maintenance dollars. Write for complete information. Armco Drainage & Metal Products, Inc., 4080 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation.

Export: The Armco International Corporation



# ARMCO PERFORATED PIPE

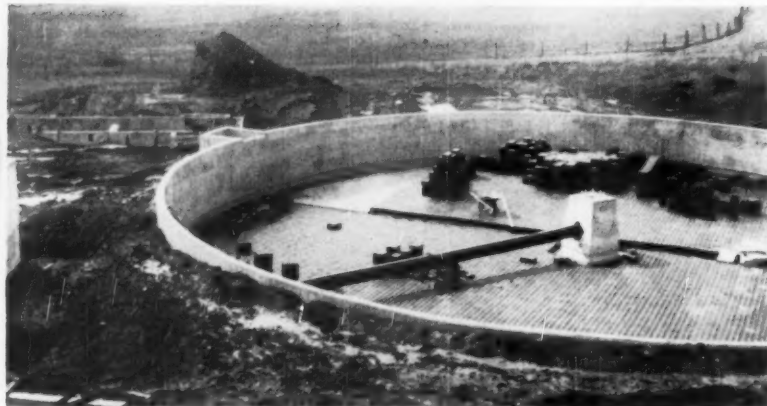


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## TODAY'S FILTER PLANTS

• use vitrified clay  
• filter bottom blocks

PLACE: **APPLE CREEK STATE SCHOOL**  
ENGINEERS: **FLOYD G. BROWNE & ASSOC.**



Laying floor of vitrified clay filter bottom blocks in new Apple Creek State School trickling filter



**FLOYD G. BROWNE**, Consulting Engineer  
**FLOYD G. BROWNE & ASSOCIATES**

This is a modern standard rate trickling filter plant designed for an equivalent population load of 7,300 persons. Some of this comes from slaughtering and canning.

The plant consists of screening, cutting, pre-aeration and grease removal, trickling filters and a final settling tank. Filter effluent may be recirculated to the pre-aeration and primary tanks.

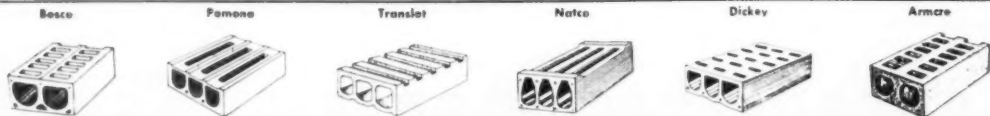
Floors in the two trickling filters are built of vitrified clay filter bottom blocks for best operating results. Each block has a smooth inner surface. They are easy to lay, self-aligning and convenient to work on after laying. And they come with standard fitting for use in any type or shape of trickling filter.

*For full engineering details,  
write any of our members today.*

Floyd G. Browne & Associates, Marion, Ohio was founded in 1930 to handle municipal and industrial engineering problems.

The many engineering projects designed and built by this firm include water, sewage and industrial waste treatment plants, storm and sanitary sewer systems, electrical generation plants, electric and steam distribution systems, refuse incinerators, and swimming pools.

### SPECIAL FEATURES: EASY TO LAY • WON'T CLOG • PROVED BY USE • RESISTS ACIDS



## TRICKLING FILTER FLOOR INSTITUTE

*Write any of our members for latest engineering data*

**W.S. DICKEY CLAY MFG. CO.**  
Kansas City 6, Mo.

**AYER-McCARREL-REAGAN CLAY CO.**  
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**NATIONAL FIREPROOFING CORP.**  
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**BOWERSTON SHALE CO.**  
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**POMONA TERRA-COTTA CO.**  
Pomona, N. C.

**TEXAS VITRIFIED PIPE CO.**  
Mineral Wells, Tex.

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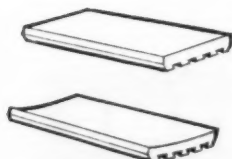
# CLAY PIPE PROTECTS 'decision buyers'

WHERE products are "decision-bought" — by engineers, consultants, or men in public life — professional reputations are constantly at stake. The choice of Vitrified Clay Pipe protects those reputations, because Clay Pipe *never wears out*. It can be specified with safety on *every* sewerage or drainage job . . . for present or future wastes, for the soil conditions of tomorrow or fifty years from now. "Bad guesses" are impossible with Vitrified Clay Pipe. You can disregard sulphide controls and the effects of sewage temperature, velocities, and age of sewage, because Clay is immune to chemical action. It's the only pipe that's *sure* to protect *your* decisions . . . by lasting forever!

**NATIONAL CLAY PIPE MANUFACTURERS, INC.**  
100 North LaSalle St., Room 2100, Chicago 2, Ill.  
703 Ninth & Hill Bldg., Los Angeles 15, Calif.  
1105 Huntington Bank Bldg., Columbus 15, Ohio  
206 Connally Building, Atlanta 3, Georgia

## SPECIFY

*Vitrified*  
**CLAY**  
  
**PIPE**



LINER PLATES

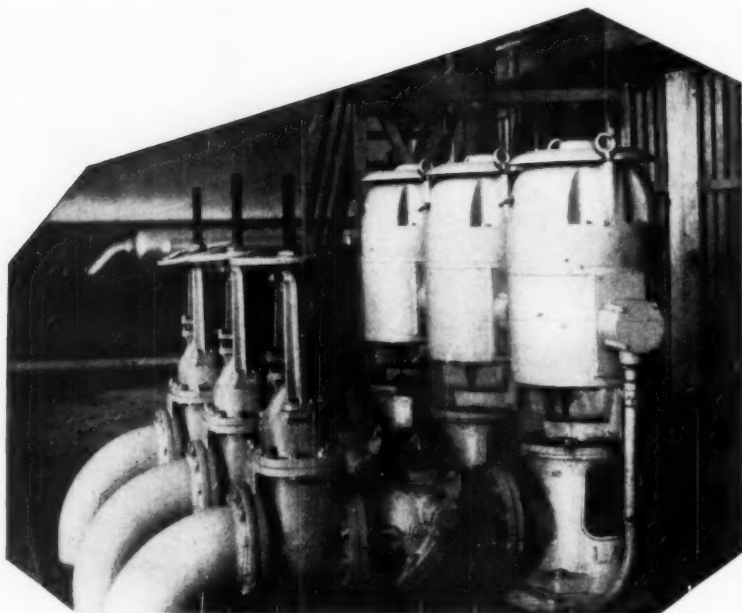


STANDARD-  
STRENGTH  
CLAY PIPE



CLAY PIPE  
FITTINGS



**VERTICAL TURBINE PUMPS**

—are built in sizes from 40 to 16,000 gallons per minute. They may be installed in existing wells, saving the expense of a new drilling job. Other uses include fire protection, booster service, cooling towers, rises pick up and a wide range of other uses. Send for the Layne Vertical Turbine Pump catalog.

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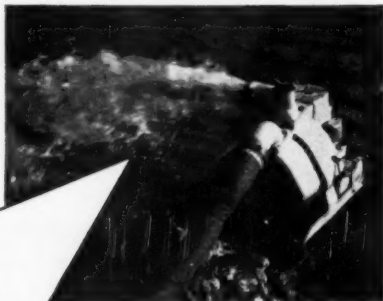
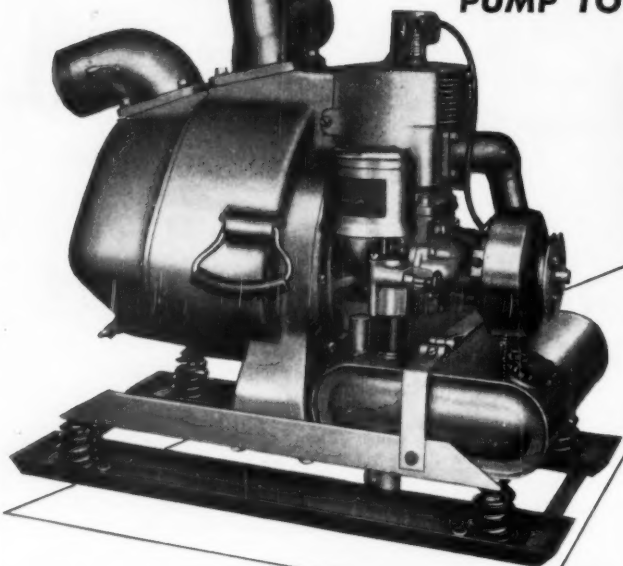
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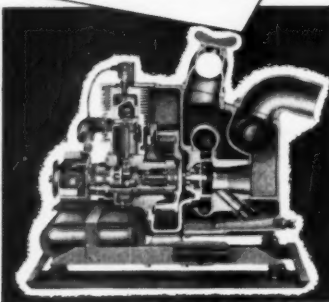
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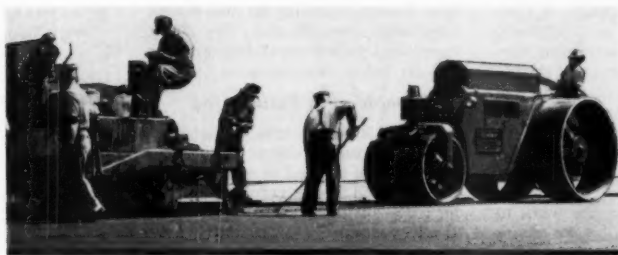
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# PUBLIC WORKS MAGAZINE

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## ASPHALTIC CONCRETE RESURFACING ELIMINATES ROUGH STREETS

**J. ROGERS MARTIN,  
V. G. THOMPSON  
and SMITH DENMAN**

**P**RIOR to 1949, the City of Enid, Oklahoma, with a population of approximately 40,000, was widely known for its tremendous wheat storage facilities and its wide, rough streets.

Like most Oklahoma cities, Enid's paving was laid some forty years ago and, during the interim, practically no money was spent on maintenance. These streets, constructed for the most part of a rigid type base of low compressive strength, made from crushed limestone, portland cement and natural cement, were covered with a sheet asphalt top which gave remarkable service under the circumstances. However, the asphalt top had worn thin, with the result that a great deal of the surface had broken out or cracked,

and after every freeze many potholes appeared.

An attempt was made in 1948 to vote bonds to carry out a major resurfacing program but the issue was defeated at the polls.

### **A Hard Winter Influences Voters**

The winter of 1948-49 was one of the most severe in the State's history. A tremendous amount of damage to Enid's streets resulted, and it became apparent to everyone that a major repair program was an absolute necessity and that further delay would be expensive. The Board of Commissioners upon the recommendation of the City Manager, Ross Taylor, employed Hudgins-Thompson-Ball and Associates, Consulting Engineers of Oklahoma City, Okla., to make a study of the street problem and to make recommendations from their findings. The engineers made extensive examinations of the existing pavement, analyzed the subsoil conditions under the pavement, studied traffic conditions and weighed the many elements which

go into proper design of a facility of this type.

Two courses of action seemed possible:

- 1) To remove all of the existing pavement and repave with either a rigid or flexible type pavement; or
- 2) To resurface the existing pavement with a flexible or rigid type material.

Because 1) the old base was still useful, though somewhat disintegrated; 2) much revenue would be lost by merchants if the streets were blocked for any length of time; and 3) favorable over-all cost factors, the engineers recommended that the streets be resurfaced with 2½ to 4 inches of asphaltic concrete of a high Hveem stability design. This recommendation was concurred in by the City Manager, who was familiar with the research work in asphaltic concrete design that had been going on, and with the short courses given as a result of this research work at Oklahoma A & M College.

After full consultation with many citizen groups, the City Manager and the engineers recommended to the Board of Commissioners that this work should be financed partly by private assessments against the abutting properties, and partly by the issuance of general obligation bonds. There was considerable skepticism and some opposition to the recommendation of the Engineer, both as to the type and method of resurfacing and to the method of financing that had been decided upon. However, a majority of the citizens took a "let's see" attitude.

A resolution was authorized setting up a paving district of forty-three blocks of the area within the fire zone which was to be paid for by private assessment. The Board of Commissioners also called an election to determine whether the citizens were willing to indebted themselves to carry on the work in sixty-three additional blocks. Both of these projects were approved by the people and thus the first important step was completed.

V. G. Thompson, Principal in the firm of Hudgins-Thompson-Ball and Associates, and Smith Denman, an Associate of the firm, were the engineers on this work. J. Rogers Martin, Professor of Research in asphalt materials at Oklahoma A & M College, and his assistant in that department, W. W. Baker, were employed as Resident Engineer and Assistant Resident Engineer, respectively. Mr. Martin and Mr. Baker were on leave from the college during the construction period. The contractor on both of the districts was the Metropolitan Paving Company, Inc., of Oklahoma City, Okla. A. J. Kavanaugh, president, and Ed Kavanaugh supervised construction for Metropolitan Paving Co., Inc.

#### **Pavement Data**

The thickness of the pavement placed on these streets ranged from 2½ to 4 inches, the heavier thickness being placed on the downtown streets. The minimum application was considered as that which would normally produce a thickness of not less than 2½ inches at any point on the pavement. Exceptions were made on a few of the blocks which were in relatively good condition, but in no case was the thickness less than 1¾ inches. In order to maintain a minimum 2-inch thickness over the high points of the old pavement, it was usually necessary to place at least 250 pounds per square yard. All of the pavement was laid in two lifts, using the same mix for both the leveling course and the sur-

face course. The average thickness over the whole job, based on the number of square yards covered and the tonnage used, was approximately 300 pounds per square yard.

The major portion of the tonnage was laid with the mix shown as Mix No. 1. During the summer months, 85-100 penetration asphalt cement was used, but this was changed to an asphalt cement with a penetration of 120 to 150 when the weather cooled off. The Hveem Stability on this mix averaged well above 50. The Hveem Stability on the design specimens was 56 and the check specimens during construction never fell far below this value.

#### **Problems in Resurfacing**

A few of the streets consisted of old concrete pavement with long slabs. These created a serious problem in minimizing cracking of the asphalt surface. The last eight blocks presented a particularly serious problem in this respect. The mix was, therefore, made a little finer and a little less rigid in the hope that it would minimize future cracking. The Hveem Stability on this material ran around 45, using 120 to 150 penetration asphalt-cement. This mix is shown as Mix No. 2.

The paving operations were as follows: The streets were thoroughly cleaned by means of picks, shovels, handbrooms, and compressed air. Great care was taken in this cleaning operation to produce a clean surface and to remove loose material from the many large cracks and potholes which existed. All old surfacing which was not well bonded to the concrete base, or which was soft, was removed and hauled away. Poorly bonded portions of the pavement usually lifted up slightly under the action of air blast used in cleaning and, hence, were easily detected. To further detect unstable areas, a tandem roller of 8-10-ton capacity was run over the area being cleaned and the effects noted. Any surfacing which showed distress under the roller was removed and replaced. Following these operations, the cracks and holes were primed with a medium-setting emulsified asphalt which was cut 50-50, by volume, with water. After this prime had cured, the holes and cracks were carefully patched and compacted by a combination of hand tamping and rolling with a 10-ton roller. The major holes were patched with the same mix that was used for the paving while the cracks were patched with sheet asphalt mixture composed of limestone screenings

and sand, with 7.5 per cent asphalt. This was necessary because the smaller patches could not have been filled successfully with the regular paving mix.

Following the patching operations, the street was tacked with 1/10 gallon per square yard of emulsified asphalt, which had been thinned in the ratio of 60 per cent water to 40 per cent emulsion, resulting in residual asphalt coverage of 0.024 gallon per square yard. This was allowed to cure thoroughly before the leveling course was placed.

The leveling course was then applied with a Barber-Greene finisher. Great care was taken in this operation to produce a surface of proper grade and cross-section. Due to the serious irregularities of the surface being covered, it was necessary, in many cases, to follow the machine with considerable hand-raking to produce a satisfactory surface. All doubtful surfaces were checked with a 10-foot straight edge and corrected if necessary. By virtue of this practice, a smooth-riding surface was obtained, which gave no difficulty when the finished surface course was placed.

Two 10-ton steel wheel rollers and a pneumatic roller were used. The initial rolling by the 10-ton steel wheel rollers was followed by a pneumatic roller before the pavement had cooled. Final rolling operations were then carried out with the 10-ton steel wheel rollers.

#### **Sealing the Parking Lanes**

The pneumatic roller was employed principally to produce a "traffic seal" for the parking lanes, particularly the parallel parking lanes. The necessity of this is apparent when it is remembered that the driving lanes quickly attain a tight surface seal which prevents scuffing of the surface. The most serious scuffing on a freshly laid pavement occurs in the parallel parking lanes, the scuffing being caused principally by the turning of the front wheels while the car is stationary. Pneumatic rolling was found to prevent this scuffing completely, particularly if the rolling occurred while the pavement was still hot to the touch.

On most of the project, the pavement was placed over the gutter and against the face of the curb to a depth of two inches. In most cases where this was done, the curb was eight inches, or more high, resulting in a minimum curb exposure of six inches after the surfacing was placed. In the remaining cases, the



old asphalt pavement was removed from the edge of the gutter out for a distance of from four to six feet. The new surface was then placed against the edge of the old concrete gutter and from  $\frac{1}{4}$  to  $\frac{1}{2}$  inch above it. It was necessary to place the pavement over the gutter in most cases, in order to correct the existing grade and restore drainage along the gutter. However, since this raised the elevation of the surface, it created a troublesome drainage problem at the intersections where the water drained onto the newly paved streets. Therefore, in some instances the pavement was laid against the gutter instead of against the curb face.

### Manhole Treatment

All of the manholes on this project were raised after the resurfacing was completed. The location of each manhole was established by scooping out a little of the asphalt directly over the center of the manhole as soon as the finisher had passed over

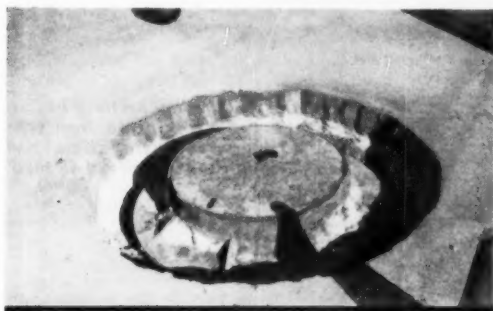
it. As an additional check, manholes were "tied in" to adjacent objects.

The raising operations were as follows: Enough of the surface was first removed over the manhole to locate its center. By means of keel and string, a circle was then inscribed on the pavement around the center of the manhole so that the outer edge of the circle was at least eight inches from the outer edge of the manhole ring. The asphalt pavement was then cut out within this circle by means of a wedge-shaped tool in the pneumatic hammer, after which the pavement inside the circle was removed. The ring and cover were then raised to a height which would leave the top of the ring and cover  $\frac{1}{4}$  inch below the surface of the pavement. This was accomplished by placing brick and stiff mortar on top of the manhole base to the desired height. The annular space formed by the manhole ring and the cut surface of the pavement was then filled with concrete, which was finished with a

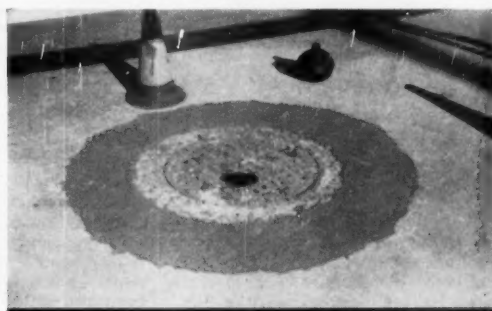
steel trowel followed by brushing. Raising the manholes in this manner, rather than in advance of the paving, carries some very obvious advantages. It saves considerable engineering time by eliminating the necessity for setting the final grade in advance for each manhole, which would have been a very troublesome operation in this case, due to the great irregularities in the old surface. Another advantage lies in the fact that it eliminates any hand tamping around the manhole. The finished manholes presented a very neat and pleasing appearance.

The first district required a total of 20,674 tons of hot-mixed hot-laid asphaltic concrete and the second district required 19,340 tons.

When the job was completed, the citizens of Enid, many of whom were listed among the skeptics, some of whom were among those who had opposed, were unanimously enthusiastic about and exceedingly proud of their smooth, new "black velvet" dress.



● CUT has been made around manhole and ring and cover raised ready to receive concrete.



● CONCRETE has been placed around manhole and ring. Methods are described more fully in text.

### MIX NO. 1

Average Grading—%		Oklahoma "Type B" Specifications
Passing $\frac{1}{2}$ "	100	90-100
Passing 4 mesh	71.0	55-80
Passing 10 mesh	48.2	40-55
Passing 40 mesh	29.5	20-37
Passing 80 mesh	15.5	10-25
Passing 200 mesh	6.9	4-8
Asphalt Content	6.0	5-7
Hveem Stability	56.	
Average Field Density	94.5%	

### Aggregate Composition

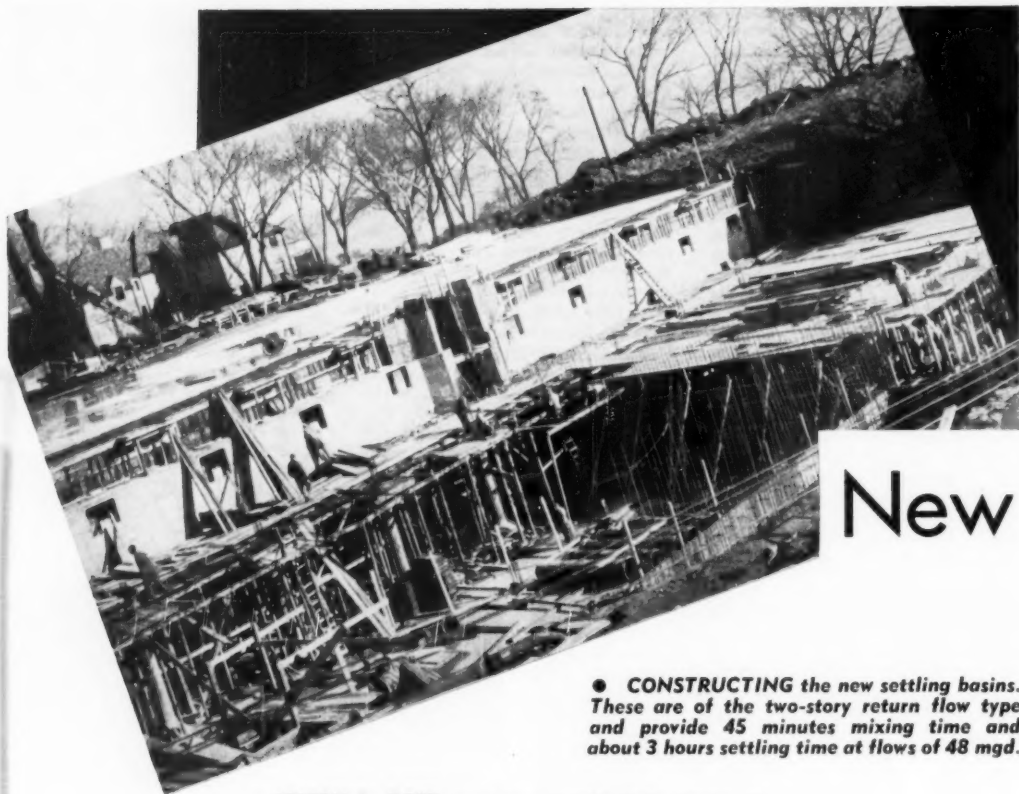
	% by weight
$\frac{1}{2}$ " to 10 mesh Joplin Chat	45
Minus 4 mesh limestone screenings	35
Fine Sand	20
<b>Total</b>	<b>100</b>

### MIX NO. 2

Average Grading—%		Special Specifications
Passing $\frac{1}{2}$ "	100.0	90-100
Passing 4 mesh	85.0	60-90
Passing 10 mesh	52.0	45-60
Passing 40 mesh	37.0	25-40
Passing 80 mesh	16.5	10-25
Passing 200 mesh	6.5	5-9
Asphalt Content	6.0	
Hveem Stability	47.	
Average Field Density	94.5%	

### Aggregate Composition

	% by weight
$\frac{1}{2}$ " to 10 mesh limestone	40
Minus 4 mesh limestone screenings	30
Fine Sand	30
<b>Total</b>	<b>100</b>



# New

● **CONSTRUCTING** the new settling basins. These are of the two-story return flow type and provide 45 minutes mixing time and about 3 hours settling time at flows of 48 mgd.

**JOSEPH L. ROSE**, Commissioner of Public Works, Evanston, Ill.

**W**HEN Evanston built its 12-million gallon rapid sand filter plant in 1913 it was among the first of the Great Lakes cities to serve filtered water to its consumers. Rapid growth of the city necessitated increasing the plant capacity to 24 mgd in 1924. Following this, the City further improved water service by the addition of a 1,500,000-gallon elevated tank in the southwest part of the City in 1932; and by a 1,000,000-gallon elevated tank in 1935 near the northwest city limits. In 1934, a 5-million gallon filtered water reservoir was built opposite the pumping station, bringing the ground level filtered water storage capacity, including the clear well at the filter plant, to a total of 7,400,000 gallons.

In 1941, the City began furnishing water to a part of the Village of Skokie, and since 1944 it has been furnishing the entire water supply of Skokie. While the population of this adjoining community (approximately 15,000) is relatively small

compared with that of Evanston, the area is 50% greater than that of Evanston and a large population growth is to be expected in the near future. Meantime, Evanston has reached a population of approximately 73,500 and has definitely come to the limit of capacity of its filter plant.

#### Latest Plant Improvements

The following improvements are now under way: 1) New mixing and settling basins to replace the old basins; 2) a 24-mgd filter plant addition, doubling the plant capacity; 3) a new all-electric high service pumping station with gasoline engine stand-by; 4) conversion of the present boiler plant and high lift pumping station to a water works service building; and 5) conversion of the old east settling basins to reserve filtered water storage and use as parking space.

Upon completion of these improvements, Evanston will have a water works plant of sufficient ca-

capacity to provide the water supply requirements for, we hope, the next 20 years or more.

The settling basins are in duplicate. These are of the two-story return-flow type with slow mix basins on the upper level adjoining the filter plant. Our restricted site makes two-story basins of this type peculiarly suitable. The basins are designed to provide 45 minutes mixing time and about 3 hours settling time at filter plant rated capacity of 48 million gallons per day.

#### Filters and Clear Well

The new filters are built over a clear well of 1,250,000 gallons capacity. There are 6 new filters, each of 4 mgd capacity at standard rating of 2 gallons per square foot per minute. Three 10 mgd wash pumps are provided at pipe gallery level under the new main entrance corridor to provide for washing the filters directly from the clear well. However, the present 100,000-gallon wash water tank will be retained.

Because of the prospect that further plant extensions will some day be necessary on our restricted site, the clear well floor was located at a level 4 ft. below that of the old clear well. The new clear well floor level is at elevation -2.5, which corresponds with that of the reservoir built in 1934.

To make way for the filter addition, while preserving the continuity of the filter building, the new filters are built in the space formerly occupied by the original (1913) coagulation basins. These were of groined arch construction, with floor elevation at about +9, so that the excavation for the new basins was carried about 12 ft. lower. While the filter addition adjoins the present

division, employees' quarters, superintendent's office and water department office.

The present low lift pump room will adjoin the service building on the east and will remain in service. It has been connected with the new high service pump house by an underground passageway. By lowering the shore end of the present 30" and 36" intake lines in the present suction wells, the available capacity of these two intake lines will be increased to approximately the rated capacity of the enlarged filter plant. It will be necessary only to make additions of low lift pump capacity, when the demand is such as to make this advisable.

A new high lift pumping station

### Water Consumption

A wide spread between the average daily consumption and the maximum 24-hour consumption is characteristic of the Evanston system as shown by the following pumpage figures in millions of gallons per day for the past few years:

Year	Average day	Maximum 24 hrs.
1945	11.9	23.8
1946	11.46	23.17
1947	11.78	25.29
1948	13.67	27.44

It is apparent that the maximum 24-hour pumpage to be expected is

# Mixing-Settling Basins

## PRODUCE LONGER FILTER RUNS

filter building, the operating gallery is offset. This provides for greater width of filter addition so that the desired capacity can be accommodated in the overall length made available by removing the original old coagulation basins.

The coagulation basins which were built in 1924 occupy the space between the new filter building and the service building, which will be provided by conversion of the present pumping station. These basins will be converted to provide a reserve storage of filtered water. They will necessarily be valved off for emergency use only because of the fact that the basins are at a higher level than the clear well and reservoirs. The top of the basins will be converted to provide parking space for cars of the Water Department personnel.

### The New Service Building

The west end of the present boiler room will be used for a heating plant with an indoor substation and storeroom on a new floor above. The balance of the main floor space will be used as a water department truck garage. The west portion of the high lift pump room will be converted to a machine shop and the east portion to serve as a water mains division general storage space; and, if necessary, truck parking.

A new second floor over the old pump room will provide for a meter

has been built east of the low lift pump room. It is equipped with 5 new electric motor driven centrifugal pumps ranging in capacity from 6 mgd to 15 mgd. The two 10 mgd units have dual drive, with gasoline engines provided against the emergency of an electric power shut-down. In this connection a gasoline engine is being installed to drive one of the low lift pumps (of 10 mgd capacity). Two electric motor driven pumps of 10 and 15 mgd capacity, respectively, from the old pumping station will be reinstalled in the high lift pump house. Space is provided for two additional units of about 20 mgd capacity. The present total installed capacity of 74 mgd is expected to suffice for the next 15 or 20 years.

twice the average daily consumption or even more.

Low lift pumping has been by electric power since 1941. The high lift pumping, on the other hand, has been done mainly by steam, the principal unit being an 18 mgd Allis-Chalmers cross-compound engine installed in 1924, and still in first class condition. However, the abandonment of steam pumping will result in more economical operation and will be an improvement from the standpoint of elimination of smoke in this part of the city which is the best residential section on the Lake Shore and immediately adjoins the campus of Northwestern University.

The new pumping station has been in service only a few weeks. Work



● THIS view of the new high-lift pumping station was taken when it was about 95 per cent complete and already was in service.



● **INSTALLING two 48-inch discharge lines from the new high-lift pumping station. Valves and fittings complicate the problem.**

is starting on conversion of the old station for use as a service building. Construction of the filter addition is about finished. This work was necessarily deferred until the new settling basins could be put in service so as to permit wrecking of the old basin on the site of the addition.

#### **Advantages Expected**

The added capacity and better performance provided by the new mixing and settling basins has been reflected in a marked increase in

length of filter runs and in reduction of wash water required.

The service building will fill a long-felt need in bringing together, practically under one roof, the several water works divisions now scattered in other parts of the city.

The plans for the improvements were prepared by Alvord, Burdick & Howson of Chicago, in cooperation with Horace R. Frye, Superintendent of the Water Department. Construction is being carried out under the supervision of Edward L. Jones.

#### **Pavement Removal Cost Reduced by 85 per cent**

A reduction of 85% in the cost of pavement removal is reported by the Cleveland Electric Illuminating Co. The first step is to cut a line of holes alongside one edge of the proposed trench with a battery of six pneumatic drills mounted on a tractor. These drills are spaced 12 ins. apart. When the six holes have been drilled, the unit is moved ahead 4 or 6 ins., so that a line of holes closely spaced results. Another line of holes on the other edge of the proposed trench is then sunk. The spaces between the holes forming each edge of the trench are

then broken through. A Gradall, straddling the trench, picks up the slabs of pavement and loads them into a truck. Then the Gradall is used to dig the trench. In addition to reducing the cost of the work, this reduced construction time.



## A MODERN

### **CHARLES LOSE**

Sanitary Engineer,  
Control Engineering Department,  
American Cyanamid Company

THE phosphate mining industry in Florida is located in a 30-square mile area east of Tampa and south of Lakeland. The American Cyanamid Company has operated mines in this area since 1911. Sewerage and sewage treatment facilities have recently been provided for the Village of Brewster, the center of American Cyanamid Company's activities in Florida. The population is about 1,200. The new installation includes a complete sewage collection system serving every building in the community, and a modern primary treatment plant.

Two important points governed the design factors of the installation. The first was the very flat terrain which necessitated the use of minimum sewer grades and velocities, though the design followed usually accepted minima. The second point was the necessity of providing a flexible plant, simple and easy for an unskilled man to learn to operate.

Sewer sizes range from 6 inches to 12 inches, and flushing manholes were installed at all dead ends. The main sewer discharges into a wet well. There are two vertical open shaft sewage pumps, both furnished by the Chicago Pump Company. These have capacities of 150 gpm and 250 gpm. The larger pump is equipped with a Wisconsin stand-by gasoline engine and a Johnson right angle drive. The sewage pumps are activated by an Automatic Control liquid level control. The pumps and level control circuits are connected to an operating panel which includes, in addition to the high and low level alarm system, a red and green signal light arrangement which gives the operator visual information on pump operation.

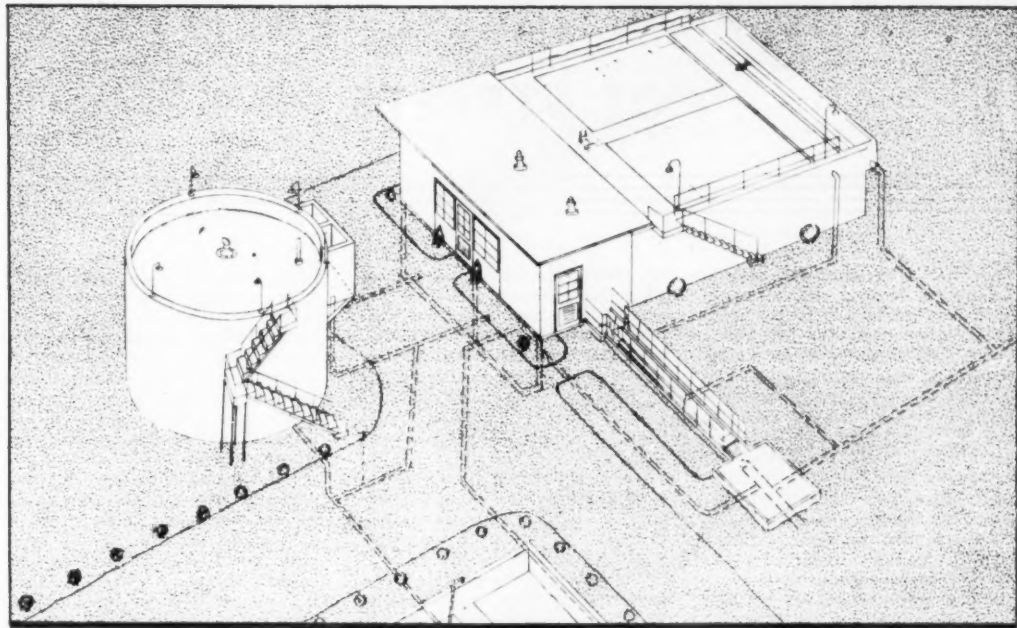
#### **The Treatment Plant**

A single unit, 23 feet 6 inches long and 3 feet 3 inches wide, contains a manually cleaned bar screen and a grit chamber with adjustable proportional weir, stilling basin, and parabolic flume.

There are two primary settling tanks, Link-Belt equipped, each 32 feet long, 10 feet wide and 8 feet



# SEWERAGE PLAN DESIGNED FOR A SMALL COMMUNITY



• VIEW of the Brewster plant: Primary tanks at top; digester; corner of sludge beds, bottom.

water depth. When both are in operation, an average detention of three hours is provided; and, since practically the entire male population starts and stops work at the same time, rather severe peak loads occur. A minimum detention of 45 minutes for this peak was considered essential. However, the tanks are so arranged that either or both may be used, and it is possible that during some periods, it may be advantageous to use only one settling tank. The tanks are equipped with Rotoline type scum removers. The sludge collection equipment will probably be operated for short periods either once or twice a day, as experience dictates. The 75 gpm single plunger sludge pump was provided by the Chicago Pump Company.

## Sludge Digestion and Disposal

The digestion tank is unheated and provides a capacity of 3.9 cubic feet per capita for the design population of 2,000. The tank is 25 feet in diameter and has a side water depth

of 18 feet. The freeboard is 3 feet 9 inches. Digester equipment is Dorr, Type MA, having a mixer and a centrally guided gasholder. It is expected that the mixer, which has a circulating capacity of 5,000 gpm, will be operated for 30 to 50 minutes after addition of raw sludge. The gasholder permits a 5-foot draw-down in liquid level, and a 30-inch lift is provided for gas storage.

The sludge drying beds are uncovered. There are four beds, with a total area of 2,000 square feet, or one square foot per capita. These beds are protected with a low concrete wall to keep children and animals out of the beds. Underdrains return the effluent to the wet well.

By-passes are provided (a) for the complete plant; (b) from the grit chamber to the plant outlet; (c) from the wet well to the final outlet; and (d) from the settling tanks to the final outlet. The sludge pump is so arranged that it will deliver sludge to the digester or the primary influent.

By-passes were considered to be essential features for proper plant operation. Maintenance, repairs and emergencies will require that certain units be by-passed on occasion. By including by-passes in the design, make-shift by-passes, which are inefficient and time consuming, are eliminated. By-passing will only be used with the permission of the State Health Department or in an emergency.

Secondary treatment is not now provided, but construction is such as to permit the installation, in the future, of a filter and a secondary settling tank without additional pumping.

Architecturally, the plant structure blends with other buildings in Brewster so that it is attractive, yet not conspicuous. The design of the treatment units was prepared by the Central Engineering Department of the American Cyanamid Company in New York in cooperation with local management, and the Florida State Department of Health.



# HOW TO FIND THE PRACTICAL CAPACITY OF STREETS

**D**ESIGN standards for streets, bridges, loadings and clearances have been established by the State of Washington Design Standards Committee. These fix streets widths as follows: Major arterial streets, 96 ft. maximum width, with six 12-ft. traffic lanes, a 4-ft. medial strip and two 10-ft. parking lanes; minimum width, 40 ft., with two 12-ft. lanes for traffic and two 8-ft. parking lanes. Secondary arterial streets, maximum width same as for major arterial streets; minimum width 38 ft., with two 11-ft. traffic lanes and two 8 ft. parking lanes.

Bridge width minimums between curbs are established at 28 ft., or at the width of the travel lanes plus 3 ft. on each side. Bridge loading standards are H20-S16-44 of the AASHTO, and design live loadings for streets are not less than 18,000-lbs. per axle. Overhead clearances are to be not less than 14 ft. 6 ins. for the full width between curbs. This applies to bridges, under-crossings, tunnels and overhead construction on arterial streets.

## Determining Street Capacities

Factors influencing the capacity of a street include (a) width of street and number of lanes; (b) curbside parking; (c) location factors; (d) composition of traffic; and (e) turning movements. The Committee prepared charts of practical working capacities of streets under various conditions, using as basic data the material developed by the studies of O. K. Norman of the Bureau of Public Roads and others. The charts herewith are modified from those prepared by the Committee, which were based on the studies by the Ohio Highway Study Committee, as substantiated by Washington State studies. Districts

are defined as follows: Downtown, where all or nearly all of the land is used for business purposes, generating considerable pedestrian volumes and much short-time parking. Intermediate, where considerable of the land area is used for commercial or industrial purposes. Outlying, where land use is primarily residential.

The charts shown are divided as to directional flows. In the downtown district, it is presumed that 55% of the traffic is in the major direction and 45% in opposite. In the intermediate areas, the classification is 60% and 40%. In outlying districts, maximum traffic is presumed to have two-thirds flowing in one direction. When the actual proportion of flow is known, it should be used in preference to the district designation. The lower chart is divided to indicate commercial traffic percentages, and two values are shown—0% to 5% and 5% to 15%. When commercial traffic exceeds 15%, the figures shown for 0% to 5% should be used and the result obtained should be multiplied by the per cent of passenger vehicles in the traffic stream.

Left turn, parking, and street width effects are also shown on the charts. Capacity values for widths not shown may be obtained by interpolation. If buses use a street for loading or unloading, the capacity value of the street is obtained by multiplying by 0.88. Fixed time traffic signals reduce traffic capacity according to the proportion of time that they show green.

## Illustrative Problem

An engineer desires to know if a section of his main street, called "Main Street" here, is deficient in ability to handle existing traffic,

This street carries two-way traffic, is 56 ft. wide, with parking permitted on both sides of the street. Left turns are permitted and commercial vehicles constitute 20% of the traffic volume. Buses operate on the street, stopping at alternate blocks in each direction. Signals are installed at three intersections; two of these allocate 40 seconds of green out of a 60-second cycle to Main St., while the other allocates 35 seconds. A vehicular traffic count shows a volume of 1,270 vehicles during the peak hour period. Considerable congestion occurs at times of peak traffic volume as evidenced by a back-up of traffic. Some vehicles have to wait for several signal cycles to pass through the signalized intersections.

## Steps in Solution of Problem

From that portion of the charts indicated for a **downtown** district, where commercial traffic forms 0% to 5% of the peak-hour volume, and **left-turns** are permitted, the capacity values are shown to be 1,860 vehicles per hour for a 50-ft. wide street and 2,260 vehicles for a 60-ft. street. Interpolation permits an estimate of 2,100 vehicles per hour for a 56-ft. street. This value is multiplied by 0.80, representing the percentage of passenger vehicles in the traffic stream. This gives a capacity of 1,680 vehicles per hour. The factor of 0.88 is then applied due to the use of the street by buses, and the capacity of the street is found to be 1,478 vehicles per hour for a 56-ft. street, with 20% commercial traffic and buses stopping on the street.

The traffic signal allows traffic to flow during 35 seconds out of 60, providing a practical working capacity of 35/60, or 0.583, of 1,478, or

862 vehicles per peak hour. This is the practical working capacity and Main street is therefore approximately 47% overloaded. Its capacity is 862 vehicles per hour and it is carrying 1,270.

The peak-hour flow may usually be considered to represent 10% of the 24-hour average daily volume. In other words,  $862 \times 10$ , or 8,620 vehicles is the practical daily working capacity of the street.

### Correcting the Deficiency

A decision must be made regarding the measures that must be taken to provide the needed capacity for Main St. The following corrective measures may be adopted:

- (1) Allot more green signal time to Main St.
- (2) Widen the street to provide two more traffic lanes.
- (3) Eliminate commercial traffic.
- (4) Eliminate bus operation.
- (5) Eliminate left turns.
- (6) Eliminate parking.
- (7) Install one-way street operation.

These measures will now be considered to determine which of them will meet the needs of the situation, using the basic capacity figures shown on the charts.

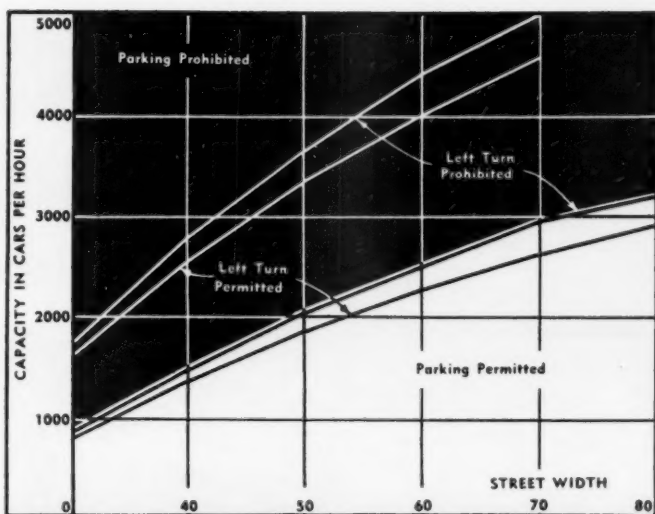
(1) **Increase in Green Time.** At the present time, Main St. is allowed 35 seconds of green time on a 60-second cycle, receiving 58.3% of the total time for vehicular movement. Increasing this to 40 seconds, or 67% of the total time would increase the practical working capacity from 862 vehicles per hour to 986 ( $2,100 \times 0.80 \times 0.88 \times 2/3 = 986$ ). This method, however, is limited by the requirements for cross-street traffic.

(2) **Widen to Provide Two More Traffic Lanes.** Widening is an expensive operation; property damage and land costs may exceed by several times the actual cost of construction. If widening is practicable, the capacity can be computed as before, using the proposed width.

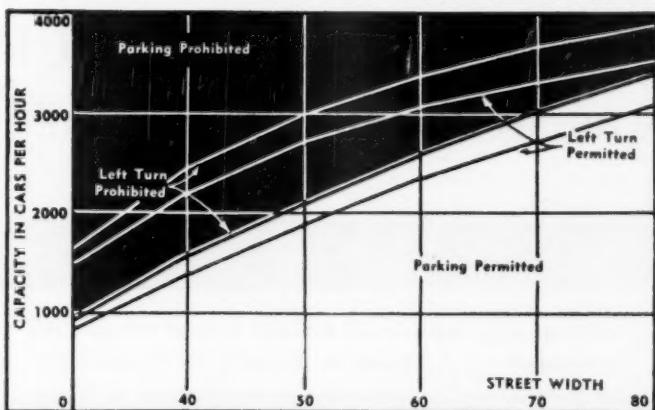
(3) **Elimination of Commercial Traffic.** By eliminating truck traffic from Main St., the practical working capacity would be increased from 862 vehicles per hour to 1,077

(Continued on page 58)

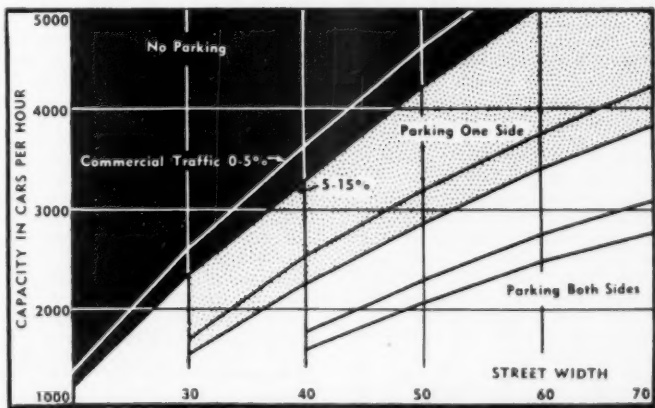
● The two upper charts are based on 5% or less of commercial traffic. When commercial traffic exceeds 5%, the method shown on the opposite page may be applied.



● DOWNTOWN area showing effect of no-parking rule on capacity.



● INTERMEDIATE area—effect on capacity of prohibiting parking.



● DOWNTOWN area—effect of commercial traffic and parking.



## How a WATER SUPPLY was developed for an AIR BASE

C. T. BAGLEY

*In charge of construction at Benedict Field at the time this water supply was developed, Mr. Bagley is now visiting Assistant Professor of Civil Engineering at the University of Illinois.*

**A**DEQUATE water supply for a small island is usually a serious and difficult problem. The ways in which this problem has been solved are many and varied, and often highly ingenious. Typical of such problems and their solution is the water supply system developed for a military airfield on the island of St. Croix, Virgin Islands.

Root of the problem of supplying potable water in adequate quantities on an island lies in the fact that no one of the natural sources of water alone may be adequate. Streams are small and often disappear during part of the year. Fresh ground water is limited; if wells are drawn down to sea level, they will probably be subject to salt-water intrusion. Rainfall is likely to be light, erratic and seasonal. Often the topography does

not include rain-catching ridges of considerable altitude. Every suitable source of water therefore must be tapped in order to produce a total supply of adequate proportions.

### Factors in Design

In planning the construction of Benedict Field, U. S. military air base on the island of St. Croix, the water problem was one of the first items requiring attention. This base was intended to accommodate approximately 300 men with two squadrons of aircraft. General features of the air base layout are shown herewith. The Caribbean Sea lies about one half mile south of the center of the air base, and an east-west ridge lies along the northern boundary of the reservation. No unusual activities of a water-consuming nature were

planned for the installation; hence it was considered sufficient to supply 30 gallons per man per day, or a total of 9,000 gallons per day. The problem was to develop a source or sources which would provide this quantity. While 30 gallons per man per day is considered



● BRACKISH water storage.

somewhat meager for a permanent camp (60 to 100 normally supplied); nevertheless conditions demanded such economizing. Experience has shown that water consumption at military installations can be kept down to this level without discomfort or lowering of hygienic standards if the following general courses of action are employed:

(1) All personnel are impressed with the fact that water is scarce and with the importance of being provident in its use.

(2) Safeguards against wastage are employed, such as:

- (a) shower keys and a shower attendant in latrines;
- (b) close supervision at laundry, motor pool, and other locations of possible heavy water use.

(3) Constant vigilance is kept against leaks and drips, and a plumber is always available.

#### Rainfall and Subsurface Data

The island of St. Croix lies approximately 100 miles ESE of Puerto Rico. It is roughly 22 miles long in an east-west direction and 6 miles wide at its middle. Of ancient diastrophic origin, the hills have been rounded and the valleys filled until the present rolling topography was obtained. The soil is a heavy clay weathered from the hills, and in the area of the air base consists universally of a pure-white caliche underlying a thin layer of top-soil. Caliche is commonly defined as a

soil whose grains are cemented together by carbonates such as lime. The carbonates are left by capillary water drawn upward through the soil and evaporated at the surface. The Benedict Field caliche is very

although its salt concentration was increasing slowly.

It was decided in the planning stage that procurement of potable water to supply all water needs of the installation would not be feasible.



● PUMP house, century-old windmill, and new well in foreground.

dense, difficult to excavate, and impervious.

Rainfall is erratic, averaging 32 inches per year, but in some years amounting to much less than that. Most of the rain falls in one or two months of the year. The evaporation rate is 80 inches per year.

The ground water supply has been successfully tapped by wells in the interior of the island, but several already in existence near Benedict Field were found to be drawing brackish, non-potable water. One, however, a half mile north and east, was drawing potable water,

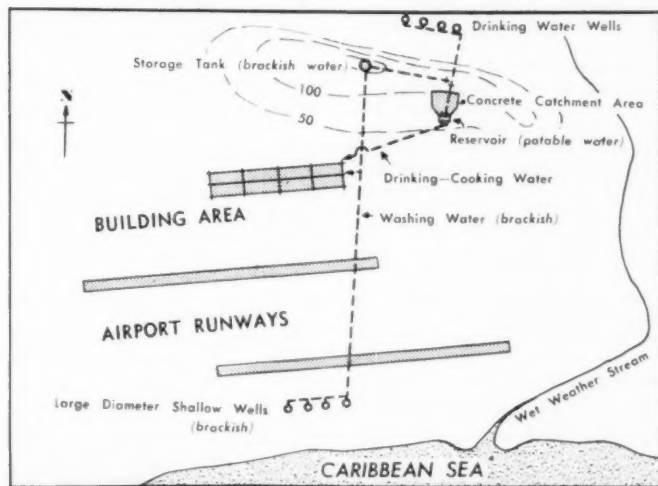
ible. As a result a dual water system was installed. Water for all purposes except cooking and drinking was secured from a system of large diameter shallow wells dug not far from the ocean shore. These wells were laid up by hand of open-jointed concrete block. The brackish water from them was pumped through a line beneath the landing field, up to a redwood storage tank at the highest point of the ridge.

Drinking water was provided, principally through the construction of a 5-acre sheet of concrete laid on the southern slope of the ridge at the north edge of the camp. Rainfall from this catchment area was channeled directly into a reservoir of 600,000 gallons capacity. This reservoir, of reinforced concrete had two separated compartments, and was almost light-tight except for openings to admit the collected rainwater. Tiny mosquito fish were kept in each compartment, necessitating fine-wire screens on the outlets.

#### The Auxiliary Supply

Because no rains fall for as long as 10 months at a stretch, an auxiliary water supply was most desirable. Toward this end, a test well was drilled in the valley north of the ridge. This yielded excellent water. Three more wells were then drilled in the same area, in line, about 300 feet apart. These wells were connected by a water main running up over the steep-walled ridge to the reservoir, and were used as a supplementary supply of

(Continued on page 50)



● SKETCH shows layout of installation described in this article, with drinking water and brackish wells and catchment areas.

# SAMPLING INDUSTRIAL WASTES



*This is an abstract of an article by Charles F. Hauck of Hall Laboratories, Inc., in the Bulletin of the American Society for Testing Materials, Dec., 1949.*

A SAMPLE of waste-transporting water taken for the purposes of analysis should be representative. Too often we concentrate our efforts on reducing errors in analysis from 0.2 to 0.15% while blithely ignoring errors of 10 to 20% in sample collection. Sampling errors may result from how the sample is taken, where it is collected, or the method of compositing.

In all instances the origin of the sample, method of collection, the type and rate of operations during the sampling period should be part of its identification. Unless the pertinent data are recorded, full interpretation of analytical results may not be possible.

Whether spot or composite samples should be collected is determined largely by the patterns of flow and concentration variations of the waste water stream and the precise purpose of sampling. When a stream carries, at various times, substances which interact with each other, such as oxidizing and reducing agents, acids and bases, hot and cold water, compositing may blot out the real characteristics of the waste water. For some purposes, such as chlorine residual, chlorine demand, dissolved oxygen determination, and bacteriological examination, composite samples are not satisfactory.

The average characteristics of a plant's water-borne wastes may sometimes be more easily and accu-

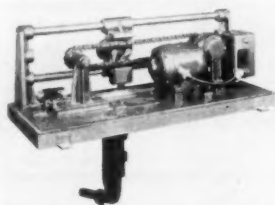
rately defined by applying statistical measures to a series of grab-sample results than from composite samples. Merely averaging grab sample results usually has little significance or validity. Definition of water-borne industrial waste composition in terms of median, mode, mean, standard deviation, probable error, confidence levels, etc. is more useful and reliable than mere reporting of individual or average results.

## Selecting Sampling Points

Selection of satisfactory sampling points is of great importance. When the profiles of composition changes are being sought, not only is such selection important but the timing of sampling at several points in the sampling process must be carefully synchronized. In general, points of great turbulence in the stream being sampled — just below a weir, orifice, nozzle, etc. — are desirable. A velocity sufficient to transport the heaviest material present is desirable—2 to 2.5 feet per second. Even these velocities are not always suf-

ficient to assure homogeneity of the water-borne waste. Dissolved substances such as acids, bases, brines, dyes, etc. travel for great distances as slugs or cylinders in large pipes or channels without blending with the surrounding water. Stratification of dissolved solids, flotation or sedimentation of suspended solids can be eliminated by turbulent velocities, or mechanical or air agitation at the sampling point.

The samples should be large enough to permit making all determinations that are desired. An additional amount may be wanted for tests not originally planned or for check analyses. Except for bacterio-



Courtesy Hardinge Co.

## ● AUTOMATIC continuous sampler with cover removed.

logical examination, a quart is the minimum practical sample size. Generally speaking, it is advisable to collect at least a 2 or 4-liter sample. When the sample must be preserved for one or more determinations, it is better to take duplicate or triplicate samples to insure the availability of complete data.

Hand sampling is laborious and its reliability depends almost entirely upon the judgment and care exercised by the sampler. Mechanical sampling practically eliminates the influence of the human factor after the samplers have been properly installed. Whenever sampling is to be continued over a long period of time, the cost of automatic sampling equipment can easily be justi-

To obtain a representative sample, we must consider these questions:

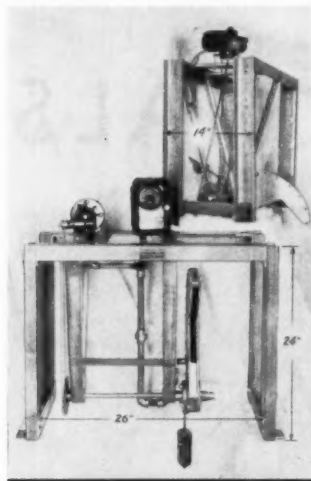
1. Is the sample intended to reflect average or spot conditions?
2. Do the volume and composition of the waste water fluctuate widely or not?
3. Are such variations in composition periodic or random?
4. Where in the waste-water flow route should the sample be obtained?
5. Is the waste water homogeneous at the sampling point?
6. How long should the sample lines be purged before the sample is taken?
7. Is it necessary to preserve the sample and how can this be accomplished?
8. How much sample will be needed to make the analyses desired?



fied on the basis of lower cost and higher accuracy.

### Automatic Samplers Preferable

Some automatic samplers collect a sample of various size proportional to the flow at fixed intervals. Most of them, however, collect a fixed volume at variable time intervals depending on flowrate. The sample



Courtesy Lakeside Engrg.

### ● CUT-Away view showing working parts of Trebler sampler.

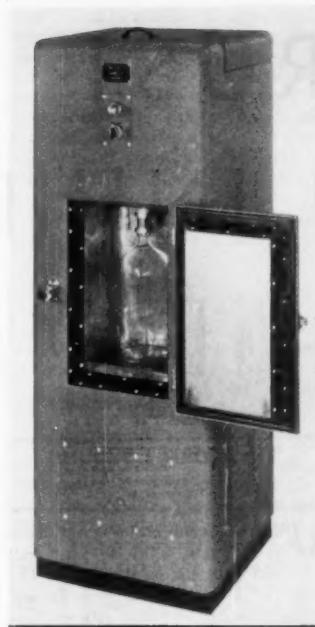
portions can be collected and transported to a storage container by a pump (Inflico, Milton Roy), plunger (De Zurick), or scoop (Trebler). The mechanism controlling the sampling device can be a timer (Trebler), water wheel (Montague Bros.), venturi, orifice, Parshall flume (Ring Balance), etc. Many plants design and fabricate their own automatic sampling gadgets. Westinghouse Air Brake Co. built a machine which will automatically measure wastewater volume, determine pH, and record both values. There are an increasing number of installations which combine continuous sampling with continuous analysis of some characteristics of the water sampled, for example, pH, conductivity, turbidity, etc.

Measurement of water flows within and leaving industrial plants may be obtained by direct means, such as an orifice, nozzle, weir, parabolic flume, Kennison nozzle, current meter, California pipe, color or salt velocity, etc. or indirectly by calculation from the time a pump operates, the time required to drain or fill a vessel, etc.

Equal in importance to collection

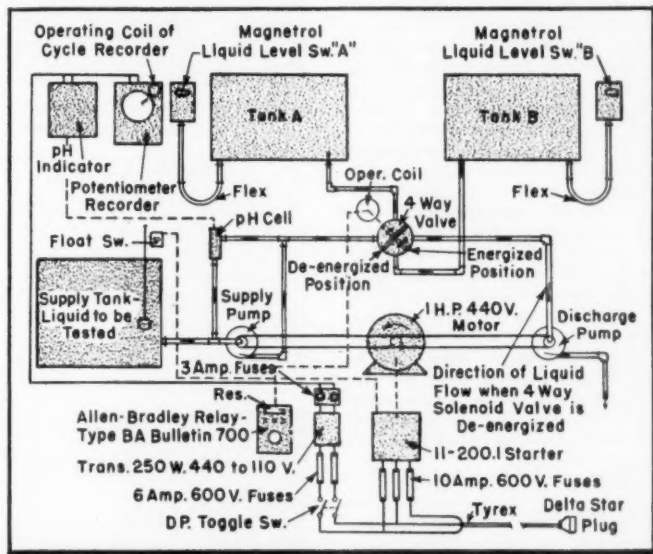
of a good sample is the preservation of its representativeness between the time of sampling and analysis. Waste-water samples may be unstable due to their chemical, physical, or biological characteristics. Concentrations of cyanide, phenol, hydrogen sulfide, dissolved oxygen, etc., change rather rapidly. Likewise, easily oxidized or reduced substances, temperature, and color are susceptible to rapid change. Solids frequently tend, depending on conditions, to coagulate or peptize, thus affecting the suspended solids value. Bacterial and microorganism counts in water samples are notably "unfixed." Water-borne wastes carrying nutrient organics such as dissolved carbohydrates and proteins will be affected quickly by biological activity. Although the instability of industrial waste samples is generally realized, present knowledge of stability limits is far from satisfactory.

Obviously the best insurance against sample change is prompt analysis. Since this is seldom practical, other antidotes for change are employed. The most common means of minimizing changes in sample composition between the time of collection and analysis is refrigeration.



Courtesy Chicago Pump Co.

### ● THIS sampler refrigerates the collected material for testing.



### ● SAMPLING arrangement proposed by the author to provide complete automatic sampling of liquid industrial waste.

Maintaining the sample at 6 to 10 C. represses the volatilization of dissolved gases, for example, oxygens, hydrogen sulfide, etc., and retards biological activity which affects both

the chemical and physical characteristics of the samples. Hatfield has shown that biological oxygen demand values decrease unless the sample is maintained at 4 C. or less.

# RUST INHIBITOR MATERIALS

## THEODORE J. YOUNG

City Engineer  
East Orange, N. J.

USE of rust inhibitive materials in conjunction with de-icing salt is a new program on the part of The City of East Orange, New Jersey. It is probably the first city in New Jersey to go all out on the use of a rust inhibitor with de-icing salt.

The problem of keeping traffic ways clear of ice and snow is particularly important in East Orange, despite the fact that there are no steep or hilly areas, because of our comparatively heavy traffic flow on all streets and on highways leading into and through the area. We employ de-icing salt on more than two-thirds of our total of 75 miles of streets. (The County takes care of five to six miles of this total.) East Orange, with a geographical area of approximately four square miles, is to a large extent an "apartment town", with many automobile owners in every block, and a population of approximately 20,000 per square mile.

Snowfall data for East Orange may be interesting to other municipal engineers in connection with this discussion. The accompanying table covers the period of 1939-1940 through 1948-1949.

Public opinion is naturally a factor here, as in every activity of the modern municipality. In our case we knew that the local residents were appreciative of the job that de-icing salt does; by the same token, we were aware that the motorists object to the abrasive action of sand. The City also objects to sand because it tends to clog sewers and storm drains. Cinders are available in this area; we have never made much use

of them and do not expect to do so.

Our preliminary laboratory tests indicated that the material known commercially as "Banox" (product of Calgon, Inc., Pittsburgh) would be effective as a rust-inhibiting additive for our de-icing salt. After some further investigation we arranged for its use, and at the same time—the early winter of 1949-1950—initiated a test program which may be of interest to others who



● THE fleet of three salt spreaders operated by the City of East Orange, N. J. A snow loader is shown at the right.

### SNOWFALL DATA

East Orange, N. J.

Winter of	Inches of snow
1939-1940	21.6
1940-1941	39.0
1941-1942	13.9
1942-1943	26.6
1943-1944	23.2
1944-1945	29.6
1945-1946	29.3
1946-1947	33.6
1947-1948	62.1
1948-1949	40.7



● LOADING a spreader, showing mixing process, chute and spreader.

wish to evaluate their own local application of rust inhibitor.

So that we may have future actual field data as to the effect of including the rust inhibitor in our de-icing salt, we requested six neighboring municipalities to assist us in our field tests. Our Superintendents of Streets together with a mechanic visited these municipalities and installed test panels in the fender wells of trucks designated by the

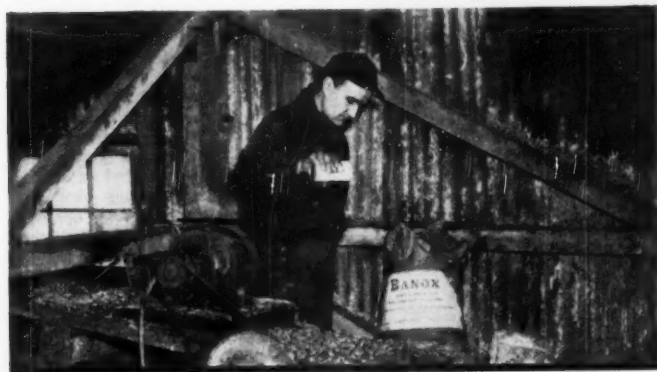
officials. All pertinent data as to the mileage covered by these vehicles; section of the city; type of work for which used; whether or not salt was used with or without an inhibitor; or if salt was not used at all; and other pertinent facts were recorded so that there was a complete history of each individual vehicle carrying the test panel.

The test panels are mounted identically in fender wells of vehicles

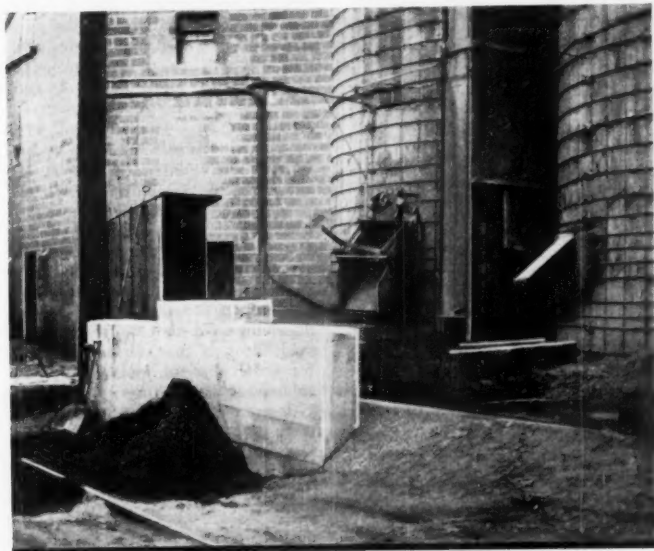
and are so located as to receive the splash of slush from the tires. Our plan calls for a sufficient length of test period (assuming a substantial total of snowfall for the winter) to permit us to elicit at least tentative conclusions on the efficacy of "inhibited salt" versus salt without inhibitor. These data are, of course, not yet available.

Another phase of our work with rust inhibitor may be of interest to

## with De-Icing Salt—



● RUST inhibitor is added to the salt as this is discharged to the spreaders in the proportion of 1% by weight of the salt.



● VIEW of rear of silo showing track hopper for unloading salt.

other city engineers. This is the method developed for the handling and mixing of the inhibitor and salt. The accompanying pictures indicate its essential nature.

Although we store most of our rock salt at a centrally located dispensing point, it has proved advisable to employ two other locations for salt storage and distribution. At these latter two, our procedure varies from that described above and illustrated in the pictures, in this way:

The rock salt, in 100-lb. bags, is stored on the second floor of the building. The salt is conveyed by gravity chute through the wall into the spreading trucks. Each chute is fitted with a knife so that when a bag of salt is dropped on the knife it rips open and dumps.

As each bag dumps, the attendant also dumps in the recommended proportion (1%) of Banox from open bags kept adjacent to the chute. We found that a satisfactory scoop for this purpose, both as to size and convenience in handling, is the ordinary standard beer can. It holds very close to one pound of the rust inhibitor. However, others may have available a "tailor-made" scoop, or other suitable device, for the purpose.

Generally speaking our experience indicates that use of rust inhibitor presents no difficult handling problem.

Public reaction to the adoption of rust inhibitor has been vocal and without exception favorable. The local press has reported it as assuring longer service life of fenders and automobile bodies. From the City's viewpoint, there would be other advantages: longer service life for municipally owned vehicles, and directional signs, traffic signals, and other tax-financed equipment.

# REVITALIZING DEEP WELLS

ROBERT B. DIEHL

Diehl Pump & Supply Co., Inc.  
Louisville, Ky.

**D**EEP wells in sand and gravel diminish in capacity due to incrustation or precipitation of solids contained in the subsurface water. Almost all ground waters contain dissolved solids which tend to precipitate first on the well strainer and then in the surrounding formations to form a hard scale deposit which seals strainer slots and cements the sand and gravel formation, closing the waterways. This incrustation, principally calcium, magnesium and iron oxide, is hastened in high capacity or over-pumped wells as it is a result of a pressure differential in the water table, created by high velocities into the well; by subjecting the strainer and the water bearing formation alternately to air and water; and by aeration of the water caused by a pump breaking suction.

Most well waters contain CO<sub>2</sub> in a dissolved state and a pressure differential causes the CO<sub>2</sub> to drop out and attack calcium causing it to precipitate. In the velocities that occur through the strainer or in the adjacent formation there are locations of high pressure differential. Aeration of well water by changing capacities and by breaking suction rapidly causes precipitation of calcium and turns Fe into iron oxide.

## Treatment with Acid

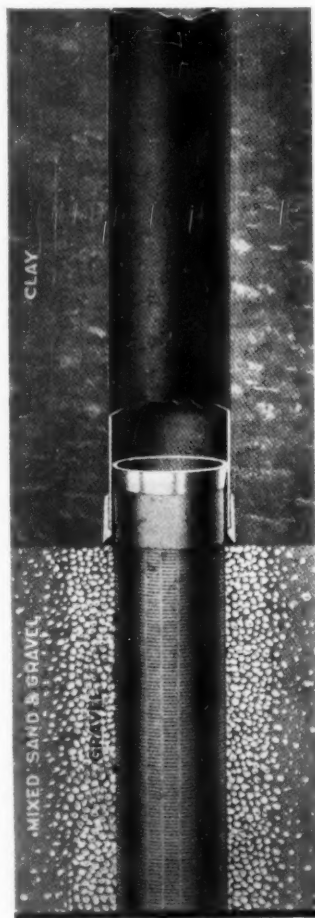
To dissolve the incrustation and increase the yield of wells, an acid treatment procedure has been developed and is used extensively. Most of the scale-forming solids are readily dissolved by muriatic (hydrochloric) acid when properly applied and agitated within the well, and records show wells increasing in capacity as much as seven times, depending, of course, upon the extent of the incrustation and the manner of acid treating. Two wells acid treated in Louisville have increased yields from 98 to 687 gpm. and from 62 to 477 gpm., indicating they were heavily incrustated. The above two wells after treatment had greater capacities than when originally drilled even though the water table had receded considerably. This is accounted for by realizing

that the proper treatment of a well with acid also involves development of the formation which probably had not been completed at the time the well was first drilled.

Each well requires a diagnosis before the amount and strength of acid required can be determined. Our usual procedure is to determine the size and length of the strainer and provide sufficient inhibited acid to more than completely fill the strainer. After the acid has been applied to the well, the volume from the top of the strainer to the static level is computed and sufficient water is poured into the well, thereby forcing the acid to the bottom of the well and filling the strainer. The acid then remains in the well from 24 to 36 hours, after which a rig is mounted over the well and, by using a special tool designed for the purpose, the well is agitated or surged, creating high velocities back and forth through the strainer openings and the surrounding formation. This tends to break up incrustation loosened by the acid, and fine sand, silt and scale are drawn into the strainer and trapped. After a half-hour of surging the strainer is bailed clean, the amount being drawn in recorded, and the surging and bailing continued until it is no longer possible to draw in any silt or sand. Should the formation fail to break up after application of the first quantity of acid, it may be desirable or necessary to repeat the entire process with more acid. A good well man can determine when the formation is clean and has been freed of incrustation by an inspection of the material trapped in the strainer and also from the action of the tools while surging.

Should it not be possible to mount a rig over the well for using the surging tools, compressed air can be used to agitate the acid in the formation. This use of air, however, does not give the high velocity of acid through the strainer and soil formation that the tools do and so is seldom as satisfactory, although it is less expensive than surging with tools.

Our organization believes that agitation and surging is necessary properly to acidize a well, as greater velocities are obtained through the strainer slots than can be created with the pump; the formation is disturbed at greater distances from the



Courtesy A. D. Cook Co.

● **CALCIUM** incrustations in gravel and on screen reduces well capacity. Opposite page shows a water lubricated high-lift turbine pump.



strainer; and the silt, sand and scale are removed, giving more open waterways through which the water reaches the well.

Precipitation of scale can be retarded if wells are tested for their capacity and then pumped at only 75 per cent of this capacity. Usually this will keep the strainer covered and the pressure differential will not be so great as to cause the scale-forming solids to fall out of the water.

#### **Treatment with Calgon**

Cleaning wells with Calgon is not as old a method as with muriatic acid; however, it is a natural outgrowth of other applications in which Calgon has been used successfully. The Diehl organization has now had sufficient experience cleaning wells with Calgon to recommend its use in preference to acid in many cases, and after the use of acid in other cases.

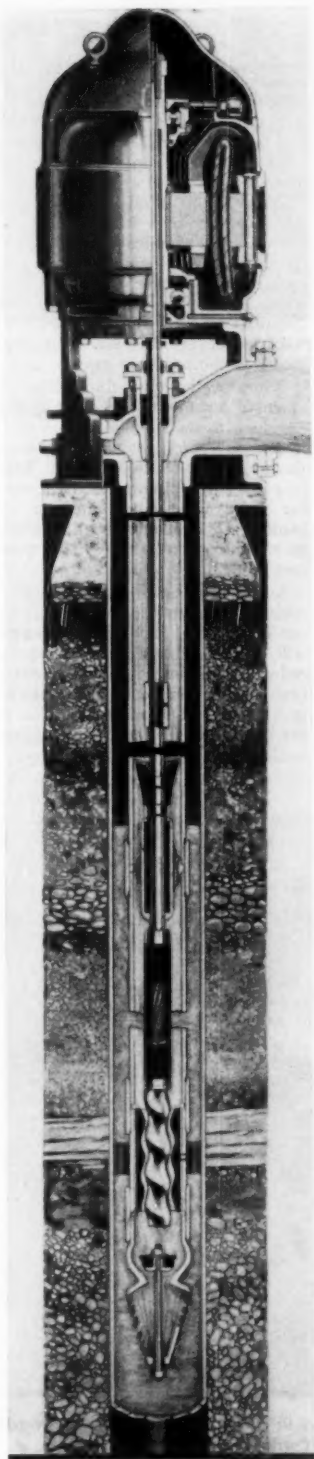
Calgon is usually slightly less expensive than muriatic acid and, particularly in wells clogged with silt, mud and calcium precipitation, it works exceptionally well. In very heavily incrustated wells, where the formation surrounding the strainer is cemented, muriatic acid thoroughly surged, seems to us still to be superior initially. This treatment as described in the foregoing has often been improved by a subsequent use of Calgon. In one instance we improved a well from 110 to 240 gpm with muriatic and followed this with our procedure of using Calgon and further improved the yield to 290 gpm. Another well using Calgon alone was increased from 35 to 125 gpm, and still another from 550 to 725 gpm.

Calgon can be used in wells within buildings where acid fumes would cause discomfort or even damage to merchandise. It may be used close to other pumping wells with more success than acid. Calgon is easily stocked and transported, and empty carboys are not a problem. Too much Calgon used at one time may result in temporary reduction of a supply and a possibility of permanent damage to the formation. Up to 20 pounds per 100 gallons of water is safe.

Where iron fixing bacteria are suspected, a solution of calcium hypochlorite should be used in conjunction with Calgon, but applied separately.

The proper use of Calgon requires at least 48 hours. During this period there should be vigorous agitation or surging at frequent intervals.

Illustration at right courtesy  
Peerless Pump Div.



Often a second Calgon treatment, immediately following the first, further improves the capacity.

A reputable well contractor fully acquainted with the relative merits of muriatic acid and Calgon should be consulted for the proper amounts to be used and the best type of surging or agitation to employ. An improperly treated well will quickly fall off in capacity and it is possible by poor use of agitation and surging even to cause ill effects.

#### **Treatment with Dry Ice**

The use of dry ice in revitalizing wells is confined almost entirely to rock wells in which muriatic acid and Calgon have proved less successful. Occasionally a sand and gravel well heavily silted with mud can be improved with dry ice.

In drilling rock wells, water bearing cracks and crevices are dissected for the supply. Often drillers fail to keep their cuttings bailed from the well and the action of the drilling tools pushes the cuttings into these cracks either sealing or restricting them. In rock wells having small water openings pumping over long periods may result in calcium carbonates being deposited in the water way and restricting the flow of the water into the well.

CO<sub>2</sub> dissolves calcium and tends to place it in solution. When dry ice is applied to a well it rapidly transforms into great volumes of CO<sub>2</sub> gas. This volume expands many feet into the openings and as the pressure is reduced by blowing out of the well casing the gas returns to the well bringing cuttings and partially dissolved solids where they can be bailed. It is not uncommon to bail 25 feet of sediment from a well after dry icing.

All new rock wells drilled by Diehl Pump and Supply Company, Inc. are thoroughly dry-iced on completion to remove all cuttings. Many old wells have been dry iced and have been materially improved. The results are dependent upon the amount of calcium precipitation and the availability of water. In one instance a well was improved from 35 to 375 gpm and in another 150 to 820 gpm.

The usual procedure is to remove the pump and set up a rig complete with special surging tools. From 300 to 1,200 pounds of dry ice, depending upon size and depth of well, are used. The dry ice is broken in pieces and applied to the well quickly. Within two minutes after applying the ice to a tight hole, water will gush from the well, often as high as 40 feet, and it has con-



tinued to gush for as long as 15 minutes. In an open well, having large cracks and crevices, this pressure forces the gas out into these openings. In adjacent rock wells, sometimes up to 1,000 feet away, the CO<sub>2</sub> can be heard bubbling, indicating a connection between the two. After all dry ice has been dissolved and the well stops working the rig is employed to swab the entire length of the well further to draw in loose materials.

Dry ice is inexpensive where available; however, long transportation problems and time of delivery can cause loss in volume. It must not be handled with bare hands.

Whenever rock wells contain sufficient pipe the top of the well can advantageously be capped and provided with a gate valve and pressure gauge. Eighty pounds of pressure will assure the CO<sub>2</sub> going far into the formation; however, care should be exercised that the pipe or casing is not blown from the ground by the pressure.

Should a well be materially improved by use of dry ice, the use of Calgon may further improve and clean the well. It will not be necessary to surge the Calgon with drilling tools as pumping will cause the Calgon, in these rock wells, to permeate the cracks and crevices sufficiently to do a final cleaning job.

### Summary

Consider that a well is like any other piece of machinery. It requires cleaning and repair occasionally. Realize the tons of water being pumped from wells, and also realize incrustation occurs in this flow below ground as it may in pipes above ground. Wells can be cleaned by muriatic acid, Calgon, dry ice, and other chemical agents. The proper chemical amount and procedure is a matter of record from experience with Diehl Pump and Supply Company, Inc., who have revitalized over 200 wells in four states in the past five years.

When wells have diminished in capacity considerable thought should be given to their revitalization as it is not only the cost of a new well that must be considered but also new discharge piping, electrical wiring and protection to the pump. It is often economical to spend as much on revitalizing as a new well would cost to drill.

Any questions on specific problems directed to the writer will be considered and an honest attempt will be made to recommend a procedure to follow. In considering new wells a plain well is far easier to revitalize than a gravel pack if the formation is such that plain wells can properly be installed.

### Air Base Water Supply

(Continued from page 43)

drinking water. At these wells the ground surface is about 30 feet above sea level, and the wells extend downward to about 20 feet below sea level. Deep well pumps were used, operating against a head of about 130 feet to boost the water over the ridge.

Water from the wells could also be directed into the brackish water storage tank. A check valve and manually operated valves were employed at the junction, so that the brackish water from the tank could not invade the reservoir. Leakage of a small amount of water past the valves, however, would not constitute a hazard since the brackish water is not polluted, and a very slight addition of sea water compounds to the reservoir water would be the only result.

Pumping of the drinking water wells had to be carefully controlled. Should the water level in the wells be reduced to as little as 6 ins. above sea level, salt water might begin to intrude, and the quality of the water would then rapidly deteriorate. Control was maintained by constantly checking the water level in the wells, and through periodic chemical tests of the water.

Credit for the planning of the Benedict Field water system is due Col. P. F. Kromer and Lt. Col. A. H. Bagnulo, officers of the Corps of Engineers. Lt. Col. Bagnulo also supervised most of the construction. The plan details were prepared in the office of the Department Engineer, San Juan, P. R., under the direction of Cpl. Kromer.

### Traffic Striping in Oklahoma

During the final 6 months of 1949, 2,033 miles of Oklahoma highways were provided with yellow reflectorized barrier lines. Raised center lines were also provided on several thousand miles of highways. In all 4,953 miles of roads were treated.

### Sidewalk Laid on Top of Storm Drain

A new 40 ft. concrete highway on Route 16, near Beckley, W. Va., has a 4-ft. by 6-ft. storm drain contiguous to it for a distance of about a half-mile. The drain was made rectangular in shape and the top finished as a 6-ft. wide sidewalk with curb of normal height.



● WELL drilled in Tacoma, Wash., in 1948-49 produced 11 mgd. City drilling crew shown at left and drilling ring in rear.



● **PREPARING** bridge for resurfacing.



● **COMPLETED** surfacing on bridge lane.

## **BITUMINOUS RESURFACING SOLVES STREET MAINTENANCE PROBLEM**

### **PATRICK J. FOLEY**

*Commissioner of Public Works  
New Bedford, Mass.*

**I**T HAS been my good fortune to be associated with the City of New Bedford for a period of over 40 years. I have seen it develop and grow into a city of over 100,000 population and although I have played an integral part in the building of its streets, sidewalks and sewers, I can truthfully say that the most interesting part of my work has taken place in the past seven or eight years when a program of resurfacing our city streets with "type I" bituminous concrete got under way.

It all began during the war years when steel was badly needed and New Bedford wanted to do its share in the war effort. Trolleys had been replaced by buses over most of the city, and it was decided to turn in the rails to the government. It was then that "type I" was first used to cover up these streets where the car rails had been excavated.

### **Laying the Surfacing**

Type I bituminous concrete is a mixture of asphalt, sand and screenings. It is delivered hot from the asphalt plant in covered trucks and dumped into a spreader where it is evenly distributed over the street to be resurfaced with the help of men with rakes. Because of the extreme heat of the mix, the men are required to wear wooden shoes to prevent burning their feet. Before this hot mix is spread, a tar tack is first

applied to the existing surface to make the new surfacing adhere to the street.

This work is done very quickly and when the weather is favorable, 275 tons of the material can be spread in an 8-hour day.

As this bituminous concrete is laid two inches thick, approximately 10 square yards are covered with a ton. After it is spread, a tandem roller is used to compact the material and two hours later the street is open for public use.

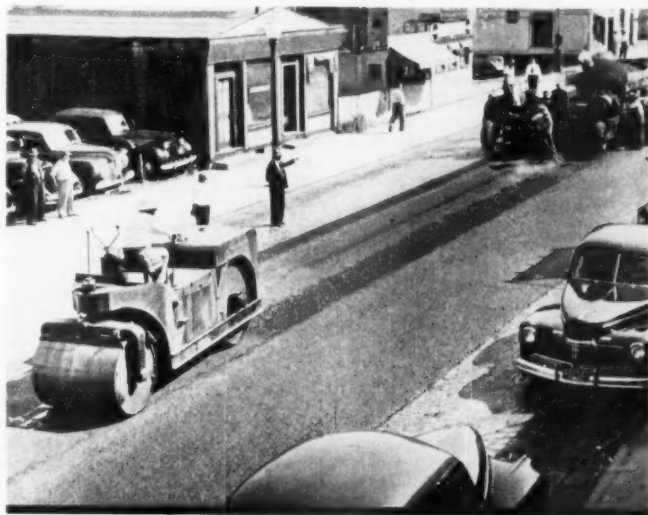
This program of laying a 2-inch top of type I material has been used

to advantage over existing surfaces of the following types of streets:

1. Car rail streets (car rails not removed)
2. Waterbound macadam streets
3. Bituminous macadam streets.

It has made our deteriorating streets into beautiful roads that should last for many years to come. I have carefully checked one of the first streets resurfaced in this way, and have found it to be in perfect condition although the resurfacing was done in 1943 and it is a heavily traveled road.

This program of resurfacing began in 1943 and has continued up to the present time. During the past three years, Mayor Arthur N. Harriman has floated bond issues to the extent of \$550,000 in order to provide the necessary funds for this department.



● **PAVER** and roller at work resurfacing old block pavement with asphaltic concrete. A 2-inch surfacing is laid.

# HOW EQUIPMENT IS USED EFFECTIVELY IN COUNTY HIGHWAY WORK

**E**FFECTIVE use of equipment is necessary under present day conditions if construction and maintenance costs are to be kept within bounds. On a recent questionnaire sent to county engineers and superintendents, the question was asked: "On what job during the past year did you use equipment most effectively and what type of equipment was it?" The first installment of replies, which totalled nearly 500, is reported on in this article and another one to be published later.

The intelligent use of equipment and the ability to organize for its

utilization are the outstanding factors gained from this survey. Both of these are covered in this article, and so far as possible, the data are given in the engineer's own words. It is regretted that not all replies could be included in this report but so many were received that it was necessary to limit the material published to typical and outstanding applications.

For convenience in use and reference, reports have been grouped by location into six general sections covering related portions of the nation.

## SOUTHEASTERN STATES

Equipment was used effectively in Limestone Co., Ala., on a dirt-moving project for road grading. There was very little overhaul; large tractors and 8 and 12-yd. scrapers were used. The most interesting job of the year was processing local float gravel for a DBST project—crushing oversize, washing and screening. This was the first time this processing was tried in this county and excellent results were obtained. A pool of equipment is maintained for road work—3 tractors, 3 scrapers, one motor grader, one shovel, 7 dump trucks, two wheel tractors, two sheepsfoot rollers, one bulldozer, two water tanks and service vehicles—in addition to a county-wide pool from which additional equipment can be drawn. For maintenance, the county is divided into four districts, each of which has its own equipment, consisting of dump and flat-body trucks, motor patrols, tractors, graders, mowers and a shovel or dragline. Other county-owned equipment includes tandem rollers, an air compressor, spreader box, bituminous distributor, bituminous mixing

plant, concrete mixers, vibrators, pumps and a rubber-tired roller. The county has a central maintenance shop in which all equipment is repaired at a considerable saving. Henry C. Mabry is County Engineer, with headquarters at Athens, Ala.

Escambia Co., Ala., laid 15 miles of surfacing, using 100 lbs. of plant mix per square yard on a primed SC base. The surfacing was mixed in a 1000-lb. portable batch plant, which is moved from job to job and uses local aggregate. R. E. Taylor, Brewton, Ala., is County Engineer.

### Sandy Clay Treatments

Construction of 8 miles of Farm-to-Market roads was one of the principal jobs done by Crenshaw Co., Ala., in 1949. This work included four treated timber bridges, with concrete decks and four double lines of large sized corrugated metal pipe arch. Equipment for doing this work was drawn from the four districts into which the county is divided, and consisted of four tractor and 8-yd. scraper combinations; a bulldozer; a heavy motor grader; a

medium tractor; a sheepsfoot roller; two 2-ton flat-bed trucks; four 2-ton dump trucks; a moto-crane with half-yard shovel, dragline and pile driver attachments; a 2-bag concrete mixer; 3-inch pump; a 2-inch pump; scales, wheelbarrows and minor equipment. The 8-mile project involved a great deal of relocation, and required 160,000 cu. yds. of excavation, 293 lineal ft. of treated timber bridging and numerous drainage structures. A contract was let for sand-clay base and a single surface treatment, which was completed in Oct., 1949. The cost of work done by force-account compared favorably with contract prices bid for comparable projects. Henry N. Coleman, Jr., Luverne, Ala., is County Engineer.

For county road maintenance, Montgomery Co., Ala., relies on one-man motor patrols, 8,000 to 10,000 pounds, and finds them very satisfactory. Thomas H. Edwards, Montgomery, is County Engineer. Autauga Co., Ala., has found the following equipment very effective for grading: Two heavy crawler tractors with 8-yard scrapers; one large tractor with bulldozer; a motor patrol; a wheel tractor with sheepsfoot roller; a 1½-yd. power shovel; and five 2-ton trucks. F. G. Charlton, Prattville, is County Engineer. For grading new projects, Coosa County, Alabama, uses a sheepsfoot roller; two motor patrols; a 1½-yd. shovel; six dump trucks; two 8-yd. scrapers; a bulldozer; two tractors; a 105 air compressor and a 55 hammer. R. O. Turnipseed, Rockford, Ala., is County Engineer.

An angledozer and a heavy motor patrol were used on SACP 403-B for widening and machine grading of an existing road. Hoyt Vinson, Wedowee, Ala., is County Engineer of Randolph Co., in which the above work was done.

Douglas Co., Ga., built 6½ miles of mixed-in-place roads during 1949, using all available county and



Courtesy Caterpillar Tractor Co.

● **DIESEL motor grader at work on gravel highway maintenance.**

some rented equipment, including motor graders, a dragline and trucks. Bulldozers cleared the right of way, and these were followed by tractor-drawn scrapers which did the grading. The roadbed was finished with motor graders; then trucks spread topsoil, which was compacted with sheepsfoot and rubber tired rollers. This soil base was kept wet for several days while open to traffic. A seal coat of MC-1 was allowed to cure and was followed by two courses of RC-2 with coarse and fine aggregates for the wearing surface. This county has 15 miles of built-in-place asphalt roads to maintain, all of fairly recent construction, but does not have any asphalt patching equipment. Also, the county votes early in 1950 on a bond issue for about 15 miles of paving. If approved, the county will probably be in the market for several pieces of new equipment. Information on patching and construction equipment should be addressed to H. C. Woods, Chairman, County Com'rs., Douglasville, Ga. W. P. Johnson, Winston, Rte. 1, is County Surveyor. Two draglines have been used very effectively for roadside drainage ditch construction, as well as for drainage canal construction, by Ware Co., Ga., T. H. Little, County Engineer, Waycross.

L. E. McCartt, Engineer of Kenton Co., Ky., finds patrol graders and power loaders best for roadway ditching and high-lift loaders for relocation of stream channels. In Simpson Co., Ky., George W. Hall, County Road Engineer, reports his most interesting job was cleaning ditches and loading gravel with a power loader; dirt was removed with dump trucks. As the ditches were nearly all filled, and drainage is wholly necessary, this was the best job of 1949. In Scott Co., when

making side drainage ditches, a mechanical loader handled 2½ yds. per minute. C. N. Wood is Co. Engr.

W. O. Strozier, Supervisor of Greenwood District, Sebastian Co., Ark., reports that the job on which equipment was used most effectively was: "Construction of second-class roads in the mountain section of the county. This type of road is surfaced with gravel or shale and not only gives an outlet to the residents of the

area served, but increases land valuations and permits an opportunity for school bus service. Principal equipment used was a shovel, bulldozer, air compressor and motor patrols". In the same state E. J. Roths, County Engineer, Fort Smith, reports an interesting job of asphalt resurfacing, using 150 lbs. per sq. yd. of plant mix, which was turned and spread with a motor patrol.

"In constructing a dike to protect a road, we used a motor crane with dragline bucket and leads and hammer attachment. When the piling had been driven into place, the dragline bucket was used to dig material out of the channel and backfill behind the piling." Nelson West, County Highway Engineer, Callaway Co., Mo. In New Madrid Co., Mo., Earl R. Washburn, County Highway Engineer, reports that a motor grader towed by a crawler tractor built a road section in very wet weather; angledozers were highly satisfactory in building sections on wet ground. A half-yard dragline with crane was extremely effective in driving piling, erecting bridges and installing pipe culverts in Holt Co., Mo., Sam G. Loucks, County Engineer.

## NORTHEASTERN STATES

Walter R. Miller, County Sup't. of Highways of Wayne Co., N. Y., says "We used a bulldozer, power shovel, front-end loader, grader and trucks to trim side roads, cleaning up old stone walls, rubbish, brush, vines and stumps and grading banks of earth that were snow hazards and interfered with sight distances. We widened the shoulder section to

make additional room for snow pushed off the road and trimmed up the shoulders, improving greatly the appearance of the road. This also permitted safer driving and reduced maintenance."

Lawrence E. Carney, Highway Sup't., Chenago Co., N. Y., used two power loaders on maintenance  
(Continued on page 56)



Courtesy International Harvester Co.

● **TRACTOR-bulldozer unit moves highway construction materials.**



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## ROCKWELL VALVES



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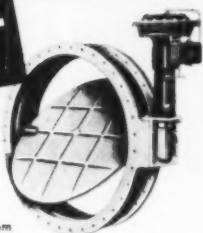
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# Public Works ENGINEERING DATA

## Bid Prices on Sewers

Bids were received Feb. 20, 1949, by the Village of Woodridge, N. Y., on sewer construction, involving about 1,600 ft. of 8 in. sewer. Bids about 10% under the estimate were \$2.11 per ft. for 8 in. vc, and \$180 each for manholes. Olney Borden, Liberty, N. Y. is consulting engineer.

## Costs of Testing, Repairing and Installing Meters

The following cost data are from the annual report of the Department of Water Supply, Detroit, Mich., for the year ending June 30, 1949. Meter testing, 32,950  $\frac{3}{4}$ -inch meters, 13.2¢ each; 5,750  $\frac{1}{2}$ -inch meters, 17.5¢ each; 1,466 1-inch meters, 30¢ each.

Based on installation of 9,227  $\frac{3}{4}$ -inch meters, the average cost of installation was \$14.22 each, of which 84¢ was for labor and cartage. Average on 775  $\frac{3}{4}$ -inch meters was \$20.82, with an average labor cost per meter of 97¢. For 472 1-inch meters, average installation cost was \$30.06, with \$1.42 each for labor.

Repair costs were as follows: For frost damage, \$3.54 per  $\frac{3}{4}$ -inch meter and \$4.08 per  $\frac{1}{2}$ -inch meter. For hot water damage, the costs were, for  $\frac{3}{4}$ -inch, \$4.02, for  $\frac{1}{2}$ -inch \$4.90, and for 1-inch \$6.97. Wear and tear repairs cost \$3.40 for  $\frac{3}{4}$ -inch, \$3.85 for  $\frac{1}{2}$ -inch and \$5.39 for 1-inch.

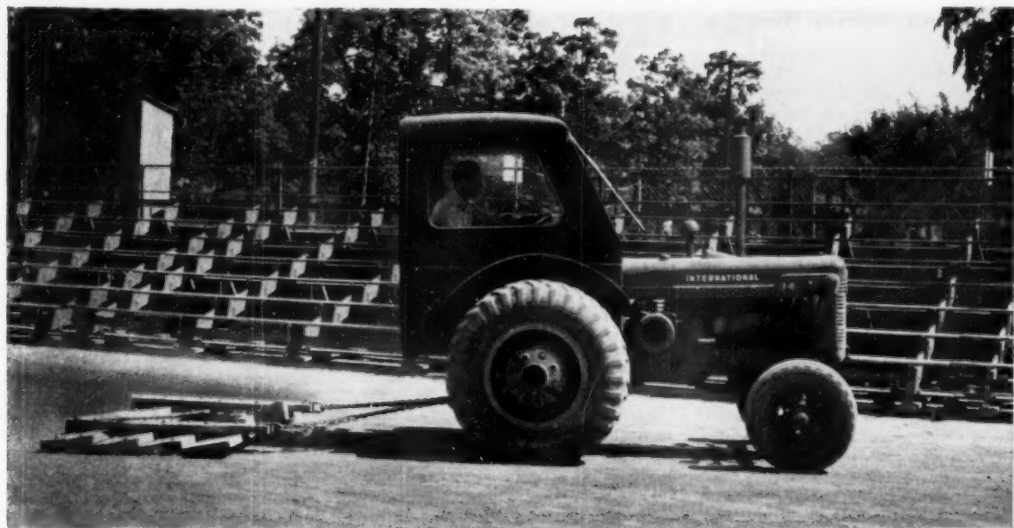
## Covington Adopts Sewer Charge

A 50 cent minimum monthly sewer charge has recently been inaugurated by Covington, Tenn., (pop. 3500). The new sewer charge is based on the amount of water consumed and is to be added to all water bills beginning with the current month. The schedule is as follows: First 5,000 gallons used, \$.50; next 5,000 gallons, \$.40; next 5,000 gallons, \$.35; next 5,000 gallons, \$.25; and all in excess of 25,000 gallons, \$.20 per 5,000.

## Modern Street Lighting System

Grand Forks, N. D., has a new street lighting system in both business and residential areas. It employs the latest type incandescent lights with 10,000 lumen and 15,000 lumen lamps. The mounting height of the lights is 28½ feet, and the system provides 1.7 foot candles illumination on the street surface in the business section and 1.2 foot candles on other streets. The average lighting for the new system is 11 times the effective lighting of the old system. The cost of the new lights in the business section was \$108,784; 80% was assessed against benefited property on a front-foot basis and 20% was paid by the city. The residential lighting system was installed by the local power company with no capital outlay by the city.





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- ID-9 (diesel), 52 engine h.p.

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## County Highway Work

(Continued from page 52)

work, cleaning ditches and trimming shoulders on 250 miles of county highways. In Warren Co., N. Y., Herrick Osborne, Sup't. of Highways, used a 1½-yd. shovel, a heavy tractor with an angled dozer, and 10 trucks to place a 35,000-yd. run-of-bank gravel fill across the head of Lake George. Ernest B. Porter, Acting Sup't. of Highways for Schuyler Co., N. Y., used a power loader mounted on a heavy truck for clearing brush from roadsides, sloping banks, widening shoulders and cleaning ditches. These improvements made snow removal easier and improved drainage.

Two Maryland counties report using equipment advantageously. Harford Co., George A. Grier, Office Manager, reports that on new road construction a mechanical loader, a heavy motor grader, and a crawler tractor and bulldozer were used. In Dorchester County, Henry Weir, County Engineer, used a power loader and dump trucks for widening and cleaning ditches.

In Cumberland Co., Pa., D. P. Raffensperger, has found that a "4-wheel drive stone spreader saves time and labor. Other equipment used effectively includes trucks,

shovels and trenchers." Levi Bird Duff, Director for Allegheny Co., Pa., reports that two new front-end loaders, one mounted on pneumatic tires and one on a tractor, gave excellent service on general clean up and stocking of cinders.

Rockingham Co., Va., S. C. Liggett, Resident Engineer, carried

on a county-wide ditching program, using a 10-ton grader, a mechanical loader, a power broom, and 4 to 6 1½-ton trucks. The grader was used to pull material out of the ditch onto the hard surface, where it was picked up and handled into trucks by the loader. The power broom was used to clean the hard surface.

## THE SOUTHWEST

"Tractors and bulldozers were used in excavating for abutments and making fills for bridge approaches; also for straightening creeks and clearing right-of-way; and for stripping quarries." G. H. Vosbrink, Highway Engineer, Franklin Co., Mo. Warren Co., Missouri, built 4.4 miles of road through timber, using a tractor and bulldozer and a motor grader. B. F. Frick is Highway Engineer. Gravel for the work was taken out with a ¾-yd. crescent dragline scraper operated by double drum hoists mounted on an old tractor. The gravel was processed with a gravel plant. Loading of aggregate into trucks was with a front-end loader on a wheel tractor.

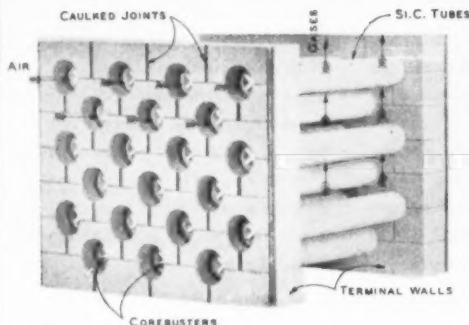
In Texas, W. R. Couch, Howard County Road Engineer, used motor graders on road maintenance, and

dump trucks with a light power shovel to haul and spread caliche for semi-all weather roads. Nacogdoches Co., Texas, voted the unit road system and employed an engineer in March, 1948. The plan is a success to date, according to K. W. McMullen, County Engineer; however, full effectiveness will not be reached for several years. The County has never hard-surfaced any of its rural roads other than those farm-to-market roads coming under the scope of the State Highway Department. There are 987 miles of unpaved roads in the county and the annual budget is \$156,000; therefore gravel surfacing will be the rule for some time to come.

In San Antonio Co., Texas, equipment was used effectively in grading and placing a flexible base on

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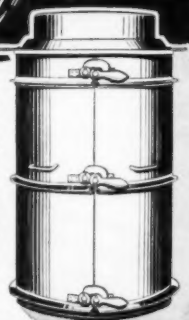
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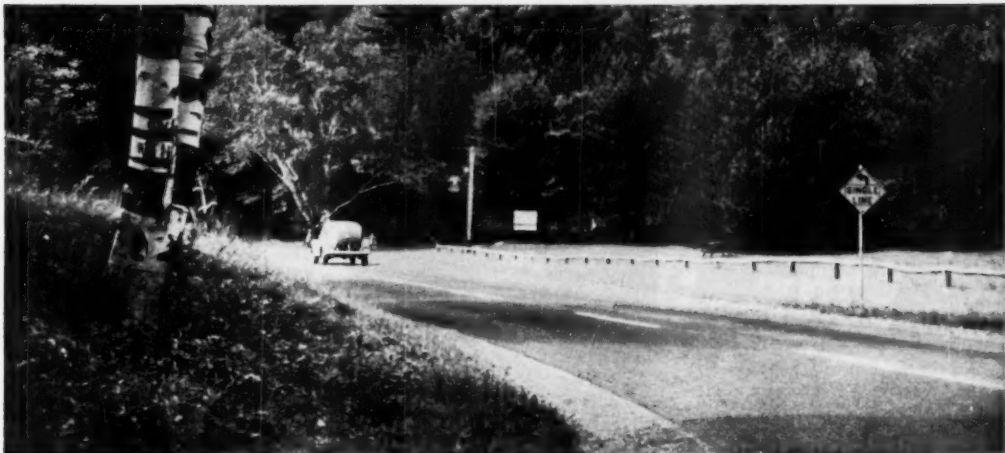
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Artesia Ave. Russell G. White, County Engineer, states that equipment used included a tractor and bulldozer,  $\frac{3}{4}$ -yd. shovel, graders, wheeled tractors and sheepfoot rollers, 3-wheel rollers and motor trucks.

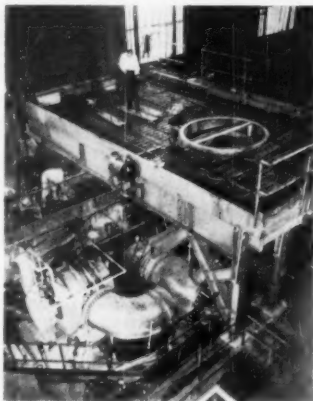
### Snow Plowing In Alaska

Snow plowing on the Richardson Highway between Valdez and Fairbanks, Alaska, is sometimes a tough job. The 19-mile stretch over Thompson Pass, where the elevation reaches 4,000 ft. and the snow is 30 ft. deep has, in the past, been too difficult. This year the Alaskan Road Commission, the Alaska Freight Lines and citizens are joining forces. The storm troops for the effort will be four heavy Kenworth trucks. Two of them will carry what are said to be the largest rotary snow plows ever made. These are Bros plows, designed to cut a clear 9-ft. wide path and to cast snow up to 300 ft. distant.

Valdez is the farthest north port in Alaska which can be used all of the year. If the road is kept open this winter, it will be the first time that it has been possible for motor vehicles to move into the interior during the winter months.

### 100 MGD Floodproof Pump for Pittsburgh Water Works

A "floodproof" water works pump, which will deliver 100 million gallons of raw water daily to the municipal water plant, regardless of river conditions, is now being installed at the Ross Pumping Station of the Pittsburgh Water Works. This plant is located on the Allegheny River. The pump is being installed



NEW pump platform under construction.

by Dravo Corp. of Pittsburgh. The pump, manufactured by De Laval, is a single-stage centrifugal pump 12 ft. 1½ ins. in diameter. Speed is 327 rpm. Drive is from a 1,250 hp synchronous motor through a 7½-inch vertical shaft. The pump suction is 54-inch and discharge is 48-inch. The designed head is 58 ft., of which 15 ft. is suction lift. The drive motor is located on a reinforced concrete platform which is above the highest flood stage ever reached by the river at this station. The record high flood occurred in 1936.

### Street Capacity

(Continued from page 41)

( $2,100 \times 0.88 \times 0.583 = 1077$ ). Such prohibition would require intensive enforcement activity and special signs; and would probably draw strong protests from truck operators and business men on the street.

(4) **Elimination of Bus Operation.** By eliminating the existing bus operation on the street, its capacity would be increased from 862 vehicles per hour to 979 ( $2,100 \times 0.80 \times 0.583 = 979$ ).

(5) **Elimination of Left Turns.**

## ARE YOU BUILDING a good Library?

GOOD reference books are an invaluable asset to every engineer. In addition to these reprints, PUBLIC WORKS Magazine recommends the following books: SEWERAGE AND SEWAGE TREATMENT by W. A. Hardenbergh, 454 pages, \$6.50; WATER SUPPLY AND PURIFICATION by W. A. Hardenbergh, popular 2nd edition, 433 pages, \$6.50; and this reprint: WATER AND SEWAGE CHEMISTRY AND CHEMICALS, 14 pages, price \$1.00.

All these publications are sold on a money back if not satisfied basis.

### Handbook of SMALL SEWAGE TREATMENT PLANTS

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- 2—Important Factors and Structural Details;
- 3—Low Rate Trickling Filters; 4—Bio-filters;
- 5—Aero-filters; 6—The Accelo Filter; 7—Sound Design Practice.

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The practical working capacity of Main St. would be increased from 862 vehicles per hour to 940 by eliminating left turns. This would probably require intensive enforcement and special signs, but would cost little and would increase street capacity 9%.

(6) **Elimination of Parking.** At the time of the study, parking was permitted on both sides of Main St. The elimination of parking on this street would increase the practical working capacity from 862 to 1,530 vehicles per hour. The need for prohibiting all-day parking or rush-hour parking only would have to be determined. Generally, the highest off-peak hourly volume is about 6% of the 24-hour average week-day volume or about 60% of the peak-hour volume. Since Main St. carries a volume of 1,270 vehicles during the peak-hour period, provision should be made during off-peak hours for about 0.60% of 1,270, or 762 vehicles per hour.

(7) **Installation of One-Way Street Operation.** The installation of one-way street operation would increase the practical maximum capacity of Main Street from the present volume of 862 vehicles per hour to the following: (a) 1,059 vehicles per hour with parking permitted on both sides of the street; (b) 1,437 vehicles per hour with parking permitted on one side of the street, and (c) 2,054 vehicles per hour with parking prohibited on both sides of the street, assuming a 56-ft. street has a practical working capacity of 5,000 vehicles per hour with no parking.

These data are determined from the charts showing the practical working capacities of one-way urban streets.

#### Acknowledgements

The State Design Standards Committee consists of the following: Chairman, C. W. Martin, Commissioner of Public Works of Walla Walla; vice-chairman, D. E. Morris, City Engineer of Tacoma; secretary, R. W. Finke, City Engineer of Seattle; members, Neil R. McKay, Assistant Director of State Aid, Washington Department of Highways; Charles E. Davis, City Engineer of Spokane; James Dunstan, City Engineer of Wenatchee; and Marvin E. Ray, City Superintendent of Pullman. Joshua H. Vogel of the Bureau of Governmental Research and Services of the University of Washington was consultant. The data were published by the Bureau in cooperation with the Association of Washington Cities.

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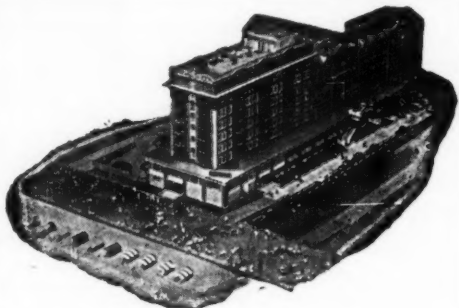


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# PUBLIC WORKS DIGESTS

SEWERAGE AND REFUSE... 61 • HIGHWAYS AND AIRPORTS... 69 • WATER WORKS... 77

*This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.*

## THE SEWERAGE AND REFUSE DIGEST

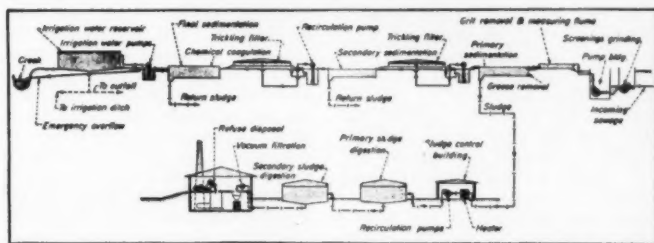
## Treating Penicillin And Streptomycin Wastes

Wastes from a plant for producing penicillin and streptomycin are largely mold and mash, those from the former averaging 13,000 ppm of BOD and from the latter 2,500 ppm. Experiments indicated that these wastes can be treated successfully by biological processes. For extended periods, a sprinkling filter operated at the rate of 1450 lb. per acre-foot gave a 96% removal. Anaerobic digestion proved very successful.

A. A. Hilgart—"Digestion and Operation of a Treatment Plant for Penicillin and Streptomycin Wastes;" *Sewage and Industrial Wastes*, February.

### Treatment Plant of Unusual Flexibility

A plant is under construction on the Davis Campus of the University of California designed to treat an average domestic flow of 1.1 mgd, supplemented at times with 1.1 mgd of wastes from an experimental food cannery, and also the output of garbage grinders to be placed in all the messhalls. The treatment will include comminution, grit removal, primary sedimentation, aeration, two-stage trickling filtration with intermediate and final sedimentation with chemical coagulation, effluent chlorination, two-stage sludge digestion with pre-heating of sludge, vacuum filtration, incineration, and pumping of final effluent for irrigation. Almost two-thirds of the sludge digestion capacity is allotted to the ground garbage. Sludge-digestion liquor will be returned to the trickling filters. Filter cake will be used as fertilizer on an experimental farm or can be burned in the in-



Courtesy Engineering News-Record

● **HIGH RATE** filter with chemical coagulation and mechanical sludge disposal.

cinerator, which will burn animals from the university laboratory.

"Flexibility Dictates Design of College Sewage Treatment Plant;" *Engineering News-Record*, March 2.

## The Problem Of Acid Wastes

The problem furnished by the enormous amounts of acid wastes being produced may be attacked along three lines: 1—Elimination or reduction of waste. 2—Recovery or utilization. 3—Treatment or neutralization. The Tennessee Copper Co., by changing its method of roasting sulfide ores, reduced its loss of sulfur in waste effluents almost 50%. As to utilization, sulfuric acid is so low-priced a commodity that little can be done with wastes containing less than 1% of  $H_2SO_4$ . A study was made of neutralization and some of the conclusions reached were as follows: Using limestone, the rate of reaction is proportional to the concentration of the acid. Dolomitic limestone can be more effective than high-calcium for acid strength exceeding 5,000 ppm. Neutralizing value generally increases as size of limestone particles decreases. The

rate of reaction increased decidedly as the temperature of the acid rose above 100°F. The use of excess limestone materially improves the reaction rate.

Edward M. Jones—"Acid Wastes Treatment," *Sewage and Industrial Wastes*, February.

## Deep Water Sewage Disposal

Plans for disposal of the sewage of Tacoma include some unusual features; one of them to dispose of the sludge from primary treatment by chlorinating it and depositing it 2500 ft. offshore on the bottom of the bay at a depth of approximately 200 ft., where tidal currents are swift and the oxygen content of the water is adequate. The liquid effluent will be chlorinated. Several existing sewers which discharge directly into the bay will be continued in use, but will be extended into the bay more than 600 ft. from shore, where the depth of the outlet is about 40 ft. below mean low tide, where the sewage will be picked up by tidal currents. These outfall extensions are being built of 36" Lock-joint pipe, supported on a

timber track spiked to piles driven in a trench.

A. R. MacPherson—"Deep Outfalls for Sewage and Sludge Disposal;" *PUBLIC WORKS*, March.

### Garbage Disposal At Saginaw, Mich.

Of the 23,000 homes in Saginaw, 60 to 70% are without regular garbage collection service, the others being served by seven licensed garbage collectors. The city is planning to provide garbage collection, and dispose of the garbage by either incineration or mixing with sewage. Study was made of disposal of combined sewage and garbage solids by (a) filtration and incineration; (b) digestion, filtration and incineration; and (c) digestion, filtration and sludge beds. Comparison was made of the estimated costs of each of these and of filtration and incineration of sewage only. The incinerator capacity required (tons per day) was estimated to be 39 for sewage only, 77 for (a), and 41 for (b); and the total annual cost at \$42,500 for sewage only, \$56,100 for (a), \$71,600 for (b). Plan (a) was adopted. Garbage, collected separately, will be dumped into a receiving hopper at the treatment plant, elevated on a pan conveyor

for hand sorting and inspection, ground in dry-type grinders and discharged into receiving tanks. From these it can be either pumped or mechanically elevated to a belt conveyor. If pumped, the garbage goes to storage and decanting tanks, where it is mixed with the raw sewage solids for dewatering on vacuum filters and followed by incineration. If elevated to the belt conveyor, it can be fed directly to the incinerator.

George E. Hubbell—"Dual Garbage and Sewage Disposal Project for Saginaw, Mich.;" *Sewage and Industrial Wastes*, February.

### Efficiency of a Recirculating Filter

A study of various methods of operating the Centralia, Mo., sewage treatment plant has been made by the U. S. P. H. S. The plant has a small, 3-ft.-deep trickling filter. The digester supernatant is automatically displaced and returned to the grit chamber. The design permitted operation both without recirculation, and with recirculation to the primary tank influent of either final effluent, filter effluent, or final clarifier underflow. One week's operation by each of these methods was studied. Without recirculation,

the overall efficiency of the plant was 85% removal of B.O.D. and 86% of suspended solids, with final effluent quality of 41 ppm of B.O.D. and 45 ppm of suspended solids. Recirculation of secondary treatment effluent to plant influent improved the plant performance; with return of final tank underflow equal to 95% of the sewage flow, the overall plant efficiency was 93% removal of B.O.D. and 91% of suspended solids, and a final effluent quality of 14 ppm B.O.D. and 27 ppm suspended solids.

W. A. Moore, R. S. Smith and C. C. Ruchhoft—"Efficiency Study of a Recirculating Sewage Filter at Centralia, Mo.;" *Sewage and Industrial Wastes*, February.

### Neutralization of Acid Iron Wastes

Spent pickle liquor, an acid iron waste produced by the steel industry, is essentially a solution of ferrous sulfate and sulfuric acid. A large number of processes have been proposed for recovering values from it, but so far only copperas has been recovered commercially, and the market demand for this could be supplied by the conversion of 4% of the pickle liquor produced annually in this country. In the ma-



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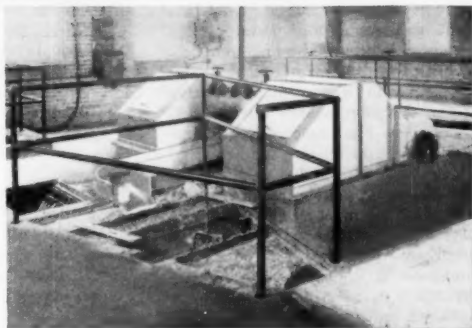
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When you need special information—consult READERS' SERVICE DEPT. on pages 93-97.

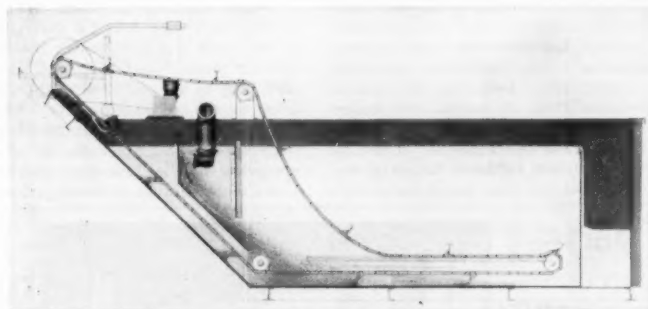
# Let Link-Belt Help You Dispose of Industrial Wastes

Safeguard public health or salvage valuable by-products from waste water, or perhaps do both, by means of Link-Belt equipment for water, sewage and industrial waste treatment. Note the four typical applications here shown.

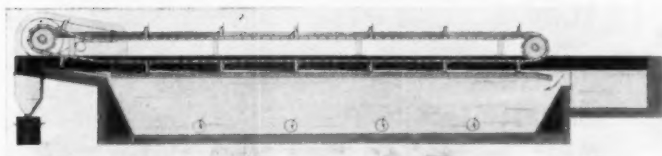
Link-Belt engineers, with a broad line of equipment and extensive experience, can aid you in planning and installing the right type of plant to solve your specific waste problems.



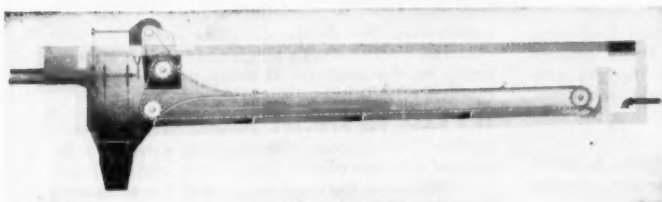
Above: Waste recovery system at large glue factory, consisting of enclosed revolving screens with settling pit and dewatering screw conveyor for the screenings.



Left: Coolant clarifying system utilizing Link-Belt dewatering conveyor. After clarification, coolant may be filtered or returned direct to grinding machines.



Left: Paper stock is recovered in the Link-Belt Save-All by a mechanical skimmer which collects the floating stock with a minimum of water.



Left: Heavy grit and detritus is removed from flume water at sugar beet factories, by settling in a tank equipped with a Link-Belt grit collector.

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# LINK-BELT



## Sanitary Engineering Equipment

jority of cases, therefore, the liquor must be neutralized to avoid pollution of streams. This produces large amounts of sludge, and disposal of this may cost more than the materials for neutralization. Important considerations are the cost, reactivity and availability of alkaline agents; space available for the neutralization plant and for sludge storage, and the anticipated volume and composition of pickle liquor and rinse water. Caustic soda is the most reactive of the common agents but is high priced. The high reactivity and low cost of high-calcium quicklime and hydrate point to these as the most universally desirable agents. Dolomitic quicklime and hydrate are less reactive but in somewhat better supply. Pulverized high-calcium limestone is a plentiful and cheap agent but its reactivity is low. Precipitated chalk is more reactive than natural calcium carbonate. Acetylene sludge is less reactive than high-calcium hydrate but might be used in a split treatment. Magnesia offers possibilities of recovering pure iron oxide and magnesium sulfate. Under only special conditions would the use of soda ash, ammonia or cement dust be practicable. The author proposes a new technique which depends on controlled oxida-

tion of the iron, in the presence of an alkaline agent, to ferrosferic oxide. The most significant feature of this process is the rapid rate of slurry subsidence; it can be dewatered on a vacuum filter at a rate about 20 times that obtainable with slurry from conventional neutralization.

Richard D. Hoak—"Acid Iron Wastes Neutralization," *Sewage and Industrial Wastes*, February.

A plant using hydrated lime and settling the sludge in a lagoon is described by Roy F. Lab in the same issue.

#### Bio-Oxidation At Chula Vista

In July 1949 Chula Vista, Calif., began operating the first plant using the Dual-Stage Oxidation process, treating the sewage from 15,000 population. The process consists of treating the sewage in two "Process Oxidators" operated in series; these being circular tanks in each of which aeration and internal sludge recirculation are carried out in a central compartment, followed by upflow sedimentation in an annular outer compartment. Provision was made for addition of chemicals ahead of the secondary oxidator, but such addition has not been found necessary.

The oxidators are 55 ft. in diameter and 10 ft. side water depth. The plant has not yet been operated with laboratory control, but a 3-day test in August showed suspended solids removals of 76.8% to 81.3% and settleable solids removal from 98.8% to 98.5%. No tests for BOD were made.

W. T. Wright—"Bio-Oxidation at Chula Vista, California," *Water & Sewage Works*, February.

#### Storm Overflows From Intercepting Sewers

Interceptors for combined sewer systems are designed to carry all the dry-weather flow plus at least a part of rainfall runoff. The capacity is commonly expressed as a multiple of the dry-weather flow. If it is 2 dwf, (as it often is) then a runoff equal to the dwf will all be carried to the treatment plant; if the runoff equals 5 dwf, and assuming a thorough mixing of both in the sewer, then only 1/3 the dwf goes to the plant and 2/3 goes to the receiving water; and if runoff is 9 dwf, 80% of the pollution in the dwf goes to the receiving water. This method of designing capacity of an interceptor is not rational, and engineers of the Interstate Sanitation Commission have developed one

## Drury-McNamee & Porter Specified TOREX IN COLOR FOR FILTERS as early as 1937

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which they present as being rational, based on dry-weather flow plus the runoff of a selected storm, the storm selected being based on the probable quantity or frequency of overflow of combined sewage to be expected, and the amount of pollution that it is permissible to discharge into the receiving water. Such rational method "will permit a more satisfactory means of designing interceptors with due regard to the effect of the storm overflow on the receiving waters."

Seth G. Hess and Frank G. Manning—"A Rational Determination of Storm Overflows from Intercepting Sewers;" *Sewage and Industrial Wastes*, February.

Another treatment of the problem of pollution by storm overflows is presented by the Sanitary Engineer of Detroit, Mich. A study of storms at that city showed that, on the average, runoff actually reaches the sewer from 89 storms a year; but if the interceptors be designed with a capacity of 6 dwf, there would still be 65 overflows a year. He concludes that no satisfactory reduction in either the number of occurrences or in the total annual duration of storm overflows can be made by any reasonable increase

in interceptor capacity; and that with no allowance for storm water in the interceptors, less than 1% of the total annual pollution carried by the sewer will reach the receiving water. If more protection from pollution is necessary, "the most effective method appears to be storm-water treatment at the individual outlets or at a common outlet for several adjacent systems." He does not approve of the separate sewerage system, saying "for extensive systems and densely populated areas, the cost of a separate system is prohibitive and the results to be expected from such a system are entirely unsatisfactory."

Clyde L. Palmer—"The Pollutional Effects of Storm Water Overflows From Combined Sewers;" *Sewage and Industrial Wastes*, February.

#### Treating Cyanide Wastes

Discharge of cyanide wastes into streams may menace public water supplies, livestock, fish life, and biological processes of sewage treatment if the CN concentration exceed 1 or 2 ppm. It is generally agreed that concentrations exceeding 0.1 ppm in water are harmful

to fish and aquatic life. Of various methods of disposal, dilution offers inadequate protection. Pounding may have limited application as a temporary measure. Acidification and aeration, and alkaline-chlorination offer the most flexibility and are applicable to almost any case. Electrolytic oxidation offers some advantages. The use of ferrous salts and lime, or the lime sulfur process, may find limited application for small plants or where the wastes are to be further treated in sewage treatment plants.

Arthur N. Corcoran—"Treatment of Cyanide Wastes from the Electroplating Industry;" *Sewage and Industrial Wastes*, February.

#### Dephenolizing By-Product Coke Wastes

Three authors describe processes used by Armco Steel Corp., National Tube Co. and Allied Chemical and Dye Corp., respectively. The process used by the first is based on the fact that phenol has an appreciable vapor pressure, particularly at temperatures of 100° C or higher, and consists of continuous recirculation of steam vapor, first through hot ammonia liquor containing phenol to remove the phenol from the liquor,

## PIPE CLEANING TOOLS FOR WATER LINES



### "FLEXIBLE" PRESSURE LINE SCRAPER

Available in sizes from 6" to 36" in diameter. These tools are pushed through mains by water pressure. Designed to travel long distances and to clean pipe thoroughly at low cost.

Illustration below shows ease with which "Flexible" Pressure Line Scraper travels through a line on its cleaning-polishing run.



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and then through hot caustic soda solution to absorb the phenol present in the steam.

The phenol recovery plant of the National Tube Co. at Lorain contains a scrubber 65 ft. high. Benzol enters the bottom of the scrubber and is distributed through 2" perforated pipe; and weak ammonia liquor, condensed from the raw coke oven gas and containing 0.075% of phenol, enters at the top and is distributed through 2" perforated pipe; the former passing upward and the latter downward through the scrubber. The phenol is extracted from the ammonia by the benzol, and from the benzol by passing it through a 20% caustic solution.

In the process used by the Allied Chem. & Dye Corp., coke oven light oil or its benzol derivative is mixed with the ammonia liquor to absorb the phenol, which is then removed by a caustic soda solution, yielding a readily marketable sodium phenolate. In addition, ammonia hydrogen sulfide and carbon dioxide are removed by distillation.

Frank Wilke, N. B. Thompson and Walter E. Carbone—"Phenol Recovery from By-product Coke Wastes;" *Sewage and Industrial Wastes*, February.

### Fixed Plate Diffusers for Chicago

In the 300-mgd addition to Chicago's West-Southwest plant, the plates for air diffusion will have a permeability rating of 80. The air will first be filtered through bag filters lined with loose asbestos fibre followed by electronic filters. Because of the computed long life with clean air and high-permeability plates, the plates will be cemented into 6-plate precast concrete holders. The holders will be placed normal to the tank walls and connected to 4" headers about 34 ft. long, each header supplied through a 6" riser. It was found that the life of diffusers before clogging is inversely proportional to the amount of dust in the air, regardless of the rate, and directly proportioned to the permeability rating.

"Chicago Sewage Treatment Plant Will Use Fixed Plate Diffusers;" *American City*, March.

### BIBLIOGRAPHY

#### American City

Bull's-Eye Sewage Treatment Plant Design. By David H. Currie, Cons. Engr. March, P. 127.  
Chicago Sewage Treatment Plant Will Use Fixed Plate Diffusers. March, P. 117.

### Contractors Record (England)

Large-Scale Composting of House Refuse with Sewage Sludge. Jan. 15, Pp. 24-26.  
Analysis of Sewage and Trade Effluents. By M. Lovett and H. Fish. Feb. 22, Pp. 11-20.

### Engineering News-Record

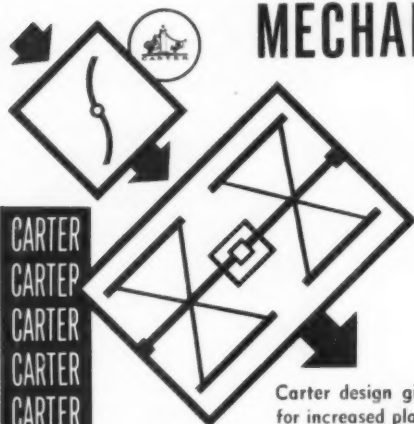
A Daytona Beach Process Treatment Plant. Feb. 16, Pp. 38-39.  
Dual Disposal Adopted by Indiana City, March 2, P. 29.  
Flexibility Dictates Design of College Sewage Treatment Plant. March 2, Pp. 46-47.

### Public Works

Deep Outfalls for Sewage and Sludge Disposal. By A. K. MacPherson. March, Pp. 30-31.  
How Storm and Sanitary Sewer Problems Were Solved. By A. J. Richardson. Asst. City Engr., Great Falls, Mont. March, Pp. 44-46.

### Sewage and Industrial Wastes

A Rational Determination of Storm Overflows From Intercepting Sewers. By Seth G. Hess and Frank G. Manning, Engrs., Interstate Sanitation Commission. February, Pp. 145-153.  
The Pollutational Effects of Storm-Water Overflows From Combined Sewers. By Clyde L. Palmer, San. Engr., Dept. of Pub. Wks., Detroit, Mich. February, Pp. 154-165.  
Mathematical Relationships in Sewage Treatment. By Ralph J. Bushce, San. Engr. February, Pp. 166-173.  
Dual Garbage and Sewage Project for Saginaw, Mich. By George E. Hubbell, Cons. Engr. February, Pp. 174-183.  
Efficiency Study of a Recirculating Sewage Filter at Centralia, Mo. By W. A. Moore, R. S. Smith and C. C. Ruchhoff, U.S.P.H.S. February, Pp. 184-189.  
Analytical Procedures for the Determination of Phenols in Water and Trade Wastes. By M. L. Richi and E. G. Will, Chem., Ohio Dept. of Health. February, Pp. 190-194.  
Phenol Recovery From By-product Coke Wastes. By Frank Wilke, Armo. Steel Corp., Walter E. Carbone, Allied Chem. & Dye Corp., and N. B. Thompson, Nat'l Tube Co. February, Pp. 196-206.  
Design and Operation of a Treatment Plant for Penicillin and Streptomycin Wastes. By



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A. A. Hilgart, Engr. Upjohn Co. February, Pp. 207-211.  
 Acid Iron Wastes Neutralization. By Richard D. Hoak, Mellon Inst. February, Pp. 212-221.  
 An Acid Iron Wastes Neutralization Plant. By Roy F. Lab. Chem., Copperweld Steel Co. February, Pp. 222-223.  
 Acid Wastes Treatment. By Edward M. Jones, Tennessee Copper Co., February, Pp. 224-227.  
 Treatment of Cyanide Wastes from the Electroplating Industry. By Arthur N. Corcoran, San Engr., Michigan Water Resources Com'n. February, Pp. 228-238.  
 Recently Enacted Federal Water Pollution Control Legislation. By M. Le Bosquet, Jr., San. Engr., U.S.P.H.S. February, Pp. 239-244.  
 Laboratory Tests for Small Sewage Treatment Plants. Discussion by Wallace W. Sanderson, Frank Woolbury Jones, T. C. Schaetzle, H. L. Galey, E. M. Babcock, G. F. Bernauer. February, Pp. 245-250.  
 Regulation and Control of Industrial Wastes Discharged to Sanitary Sewers. By G. R. Scott, San. Engr. February, Pp. 251-254.  
 Safety in Sewage Plants. By Gilbert H. Dunstan, Prof., San. Eng., Univ. of Ala. February, Pp. 259-263.  
 Effect of Acid Iron Wastes on the Worcester Trickling Filters. By Roy S. Lanphier, Chem., Dept. of Public Wks. February, Pp. 261-262.

#### Sewage and Industrial Wastes Engineering

Nearly 1,000 Treatment Plants Under Construction in 1949. By Morris M. Cohn, Editor. March, Pp. 117-130.  
 Trends in Design and Construction of Wastes Treatment Works. By 37 State Sanitary Engineers. March, Pp. 131-141, 148, 170.  
 How to Build and Finance Sewage Works. By Samuel A. Greeley, Cons. Engr. March, Pp. 142, 144, 164.

#### The Surveyor (England)

Relation of Suction Well Capacity to Soil-Sewage Pumping Rate. By L. B. Eschritt. Jan. 27, Pp. 55-56.  
 Mechanical Filtration of Sewage Effluents. Discussion of paper digested in our November, 1949 issue. Feb. 10, Pp. 81-82.

#### Water and Sewage Works

Sewage and Industrial Wastes—1949 in Review. By Arthur H. Niles, Engr-Supt., Div. of Sewage Disp., Toledo, O. February, Pp. 47-56.  
 Bio-Oxidation at Chula Vista, Calif. By H. T. Wright, Cons. Engr. February, Pp. 65-69.  
 Air Flow Measurements: A New Type Air Meter. By Charles E. Haugerty, Div. of Sew. Disp., New York City. February, Pp. 70-72.  
 Digestion Tank Troubles. By T. R. Haselbine, Cons. Engr. February, Pp. 73-75.  
 A New Type Residential Septic Tank. By Harry H. Hendon, Cons. Engr. February, Pp. 77-82.  
 Industry and Pollution Abatement: Policies, Problems and Progress in the Ohio River Valley. By Edward J. Cleary, Chf. Engr., Ohio Riv. Valley Water San. Com'n. March, Pp. 119-121.  
 Graphical Determination of B.O.D. Curve Constants. By Harold A. Thomas, Jr., Asst. Prof. of San. Eng., Harvard Univ. March, Pp. 123-124.  
 Determination of Metals in Industrial Wastes: Iron and Copper. By H. Gladys Snoop, T. Jaffe and Mary O'Callaghan. March, Pp. 125-128.  
 A Critical Evaluation of Routine Sewage Analyses. By W. W. Eichenfelder, Jr., Chem., and John W. Hood, Supt., Ridgewood, N. J. Sew. Treat. Wks. March, Pp. 138-141.

#### Pollution Abatement in Florida

In the past three years, Florida has approved 108 waste disposal projects. Of these 77 have been built or are under construction at a total cost of \$23,000,000. Also 23 small industrial waste treatment plants have been built, and 35 small plants to treat wastes from schools, trailer parks and tourist cabins. These data are from a report by the Florida State Board of Health, of which David B. Lee is chief sanitary engineer.

## GARBAGE AND REFUSE COLLECTION AND DISPOSAL

UNDER this title, a bulletin has been issued by the Texas State Department of Health. Prepared by the Bureau of Sanitary Engineering of that Department with its usual care and skill, it was sent to us through the courtesy of Dr. George W. Cox, State Health Officer. References are largely to Texas condi-

tions, but many of them are broadly pertinent.

The following weights are given as representative of the various classifications of waste: Garbage, 25 to 53 pounds per cubic foot; refuse, including ashes, 6½ to 8½ pounds per cu. ft.; refuse, including garbage (but not ashes), 9 to 11 pounds;

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MODEL 1-47

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refuse, including both garbage and ashes, 23 to 47 pounds; and ashes, 33 to 37 pounds per cu. ft.

In disposal, primary consideration is given to incineration and sanitary fill. No design data are given on incinerators, but information in regard to sanitary fill is presented covering location, details of constructing the trench and directions for operation. Information is given on sizes and costs of tractors and front-end loaders, including bull-clam shovels; also on trucks and closed-type garbage and refuse bodies.

### Equipment Needed for Collection

The example given for calculating the equipment needed for collection and for sanitary fill operation is interesting. It is based on a city of 150,000 population, with collections twice a week in the residential area and daily in the business area. It is assumed that there are 3.5 persons per housing unit, which gives 42,857 units from which residential collections must be made. It is stated that studies of different cities show there are approximately one-tenth as many commercial water connections as residential connections; there-

fore, 4,286 commercial sites must be served. With two pickups weekly from each of 42,857 residence units and 6 pickups from each of 4,286 commercial units, there will be 111,430 pickups per week, or, based on a 6-day week, 18,572 collections per day.

In the computations, an allowance is made, which naturally will vary with local conditions, of two round trips per day to the fill, each requiring 30 minutes of non-collecting time; of 5 minutes each for dumping twice; and of 10 minutes to reach the first collection site after starting out from the garage in the morning. This time, lost so far as collections go, amounts to 80 minutes per day. Deducting this from the 480 minutes of an 8-hour working day, leaves 400 minutes for the actual work of collection. Using two pickup laborers with each truck, it is assumed that a collection can be made in one minute. With 18,572 pickups to be made in 400 minutes, 46 trucks will be required.

These trucks may be divided as follows: 10 6-yd. open body trucks for bulky refuse not easily compacted, two trips each per day, total of 120 cu. yds.; 20 12-yd. packer-

type bodies for alleys and close places, holding about 16 cu. yds. of loose material, two trips each, 640 cu. yds. per day; 16 16-yd. packer-type bodies for outlying sections, holding about 20 cu. yds. each (on a loose basis), two trips per day, 640 cu. yds. The total refuse collected would amount to 1,400 cu. yds. On the basis of the weight of refuse given previously, 9 to 11 pounds per cu. ft., this would indicate a production of about 2½ pounds per person per day.

It is assumed that a front-end loading device can handle about 400 cu. yds. per 8-hour day, and on this basis, four such units would be required for work at the fill. The same computations can be utilized to determine the required size of an incinerator.

### Traffic Engineering Fellowships

Applications are now being received for graduate fellowships for the study of traffic engineering at Yale. These provide about \$1,400 per year each. Application forms may be obtained from the Director, Bureau of Highway Traffic, Strathcona Hall, Yale University, New Haven 11, Conn.



## Site-Cast 10' CONCRETE PIPE

saves  $\frac{1}{3}$  on storm sewer outlet

Comparative bids on this \$1,600,000 Midland, Michigan, project showed pre-cast concrete pipe to be  $\frac{1}{3}$  cheaper than monolithic structure. In addition to a tidy cash saving, it was possible to use local labor and materials, and keep "sewer dollars at home."

**SAVE TIME AND MONEY ON YOUR JOBS**  
Universal has made even 15' pre-fabricated concrete pipe a reality! This means savings all 'round on big jobs. No shipping costs, no handling delays. Write for details and FREE folder on Midland Project.

### THE PICTURE STORY

1. Heavy reinforcement wire cage is set inside form before concrete is poured.
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Universal plants in: Decatur & Dothan, Ala.; Tampa & Ocala, Fla.; Atlanta, Ga.; Reno, N. J.; Binghamton, Port Washington, Rochester & Syracuse, N. Y.; Columbus & Zanesville, Ohio; Harrisburg & Pittsburgh, Pa.; Nashville, Tenn.; Clarkburg and New Martinsville, West Va.

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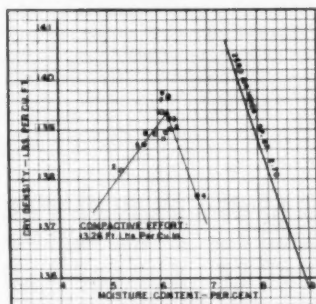
## "Siamese Twin" Pavers Speed Work

Last year, in Iowa, two concrete paving jobs were laid at rates per day reaching 3664 lin. ft. of 8-7-7-8 pavement 22 ft. wide. This speed was largely due to the use of two 34-E dual-drum pavers close-coupled side by side, traveling between the forms. The two pavers were linked together with transverse steel I-beams. Operating two pavers from the shoulders was not considered adaptable to the narrow road bed in cut and fill alternately. For delivering dry batched material to the pavers, the trucks were turned around 500 or 600 ft. before reaching the paver and backed the rest of the distance. The real bottleneck occurred between the pavers and the spreader, where subgrade paper was spread and reinforcing steel placed.

"Siamese Twin 34-E Pavers Used Side by Side Between the Forms," *Roads and Streets*, February.

## Concrete Resurfacing

Resurfacing may be needed when a pavement has reached the end of its expected life; if it is structurally inadequate because of increasing traffic weights and volumes; or because it needs widening. In preparing for resurfacing, the old surface should be put in good condition. Patching will generally be necessary only at badly broken areas where the subgrade needs attention. Old bituminous patches need not be removed. The original pavement should be swept thoroughly. The thickness of resurfacing is generally computed on the theory that the strength of the two slabs is equal to that of a single slab having a thickness equal to the square root of the sum of the squares of the two thicknesses. If there is a bond between the new pavement and the old, the thickness may be reduced slightly. Reinforcement is recommended where the old pavement shows abnormal breaking or cracking. Expansion joints can be located, or omitted altogether, regardless of those in the old pavement. Contraction joints can be



Courtesy Roads & Streets

## Moisture-density relationships in graded crushed rock and soil.

placed within one foot of, or over, expansion, contraction or construction joints in the old pavement; with intermediate ones if shorter slabs are desired.

In resurfacing city streets, to retain sufficient curb exposure it may be necessary to remove a portion of the existing pavement adjacent to the curb, or to construct a new curb with the proper height. Expansion joints should be placed at the property lines of each side of street intersections. As there is little or no absorption of water from the bottom of the new concrete, the water content should be kept to the minimum consistent with satisfactory placement and finishing. If widening is combined with resurfacing, it should be constructed integrally with it and no longitudinal joint provided over the edge of the old pavement.

J. F. Cooke—"Concrete Resurfacing: New Pavements for Old," *PUBLIC WORKS*, March.

## Triaxial Testing of Flexible Base Materials

A triaxial compression test procedure has been developed on the basis of studies pertaining to inherent quality, density, dry curing, and confinement during absorption; and on the premise that the conditions and influences which produce important effects on the load carrying capacity of actual structures in the field should be reproduced or simulated in any valid laboratory test procedure. Some of the conclusions

reached are: An impact method for compacting specimens is preferable to direct compression methods. The total material should be used in making density and strength tests whenever possible, because the presence of coarse aggregate almost invariably increases the strength of well graded flexible base materials. In making strength test specimens, the modified AASHTO hammer, weighing 10 lb. and having an 18" fall is preferred to the standard 5½ lb. hammer with a 12" drop. In testing granular materials, for general practical use, a 6" diameter of specimen is the minimum that should be used; and an 8" height of specimen is adequate for all materials unless the friction is exceptionally high. For routine investigations involving non-swelling soils and flexible base materials, a compactive effort equivalent to approximately twice that employed in the standard AASHTO test should be used.

The procedure developed was: Air-dry a 200 or 300 lb. sample; break up clay lumps to pass the ¼" screen. Add a quantity of water which, added to the hygroscopic moisture, will provide a chosen final moisture content, and mix thoroughly. Specimens 6" diameter by 8" high are compacted in four 2" layers. The dimensions and weight of specimens are determined at this stage so as to obtain an estimate of dry density. Six specimens, as nearly identical as possible, are compacted in steel molds at the optimum moisture content for the selected compactive effort; extruded from the molds and stored over night in the moist room. Specimens that do not develop shrinkage cracks upon drying are partially dried in an oven and again weighed. Axial cells are placed on the specimens and they are permitted to absorb water by capillarity for a few days or weeks. Then each specimen is tested in compression while subject to a constant lateral pressure. It is then dried at 110° C and weighed, to furnish data as to density, swell, moisture absorption, etc.

Chester McDowell—"Triaxial Testing: Its Adaptation and Application to Highway Materials," *Roads and Streets*, February.



### Seal Coats— Why, When and How

Seal coats should be used only: 1—To seal moisture and air from entering the pavements. Or 2—To non-skid a surface. 3—To rejuvenate or enliven a dry or weathered surface to improve wear resistance. 4—To improve luminosity or night visibility. 5—To reinforce and build up pavement structure. 6—Traffic lane demarcation (rumble). They should be applied at the first sign of distress, but only in good weather; not to cover defects, or to try to correct corrugations or cracking

due to base failure, or pushing or shoving due to unstable mixtures.

For proper construction it is necessary to determine: 1—The proper residual asphalt film thickness with relation to aggregate voids, considering absorption of existing road surface, porosity and absorption of aggregate, and surface and aggregate roughness. 2—Whether traffic will embed the cover stone in the existing surface. 3—The best type of asphalt for the conditions. 4—The best possible cleaning of the surface. 5—Whether the distributor and its nozzles, and the

screenings spreader are in condition for uniformity of application.

C. V. Kiefer—"Use and Abuse of Seal Coats;" *Roads and Streets*, February.

### Maintaining Oregon's Pavements

Oregon's Maintenance Dept. uses ten crews for patching its 790 miles of asphaltic pavement and 1460 miles of bituminous macadam. A crew of about 25 men consists of a foreman, plant operator, helper, kettelman, street foreman, rakers, shovelers, roller, flush coater, 7 truck drivers, flagmen, watchmen and timekeeper. Each has a portable paving plant which can be taken down, moved 40 miles, set up and be operating in 8 hours. In 1949 a new plant was purchased which averaged 223 tons an 8-hr. day. Five of the plants are 11 to 19 yr. old. The former averaged 223 tons per day worked, the five old ones 91 tons. The average cost per ton for labor and equipment was \$3.92 by the new plant, and \$6.18 by the five oldest ones. The average cost by the 9 old plants was \$5.33. Had the new plant worked the full season of 1949, the saving over the cost by the nine old plants would have more than covered its purchase price.

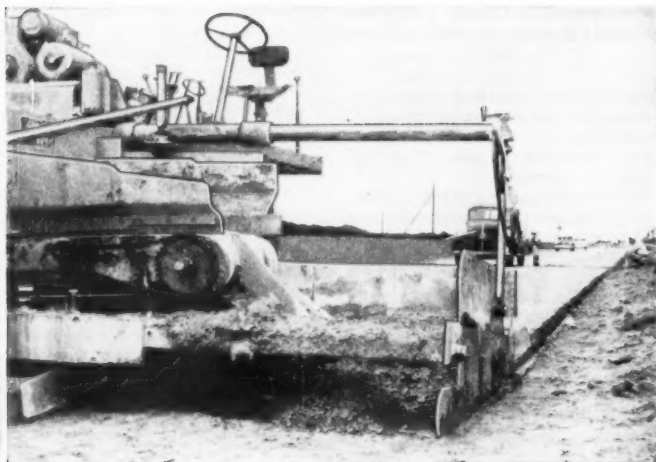
E. A. Collier—"Ten Patching Crews Keep Oregon's Pavements Repaired;" *Roads and Streets*, Feb.

### Excavating Sandstone With Rippers and Scrapers

In excavating 340,000 cu. yd. of silica sandstone to a depth of 40 to 70 ft. in road construction in Wisconsin, the contractor loosened the rock with a single-tooth ripper, when it could be loaded into a scraper with the help of a pusher. Dynamite was used along the line of the backslope to facilitate shaping; also in an occasional hard ledge. During the coldest weather the ripper was worked at night and week ends to prevent the freezing of the loosened stone. The peak day's production was 6,132 cu. yd. in a 10-hr. shift, average haul 850 ft., using six scrapers carrying an average payload of 14.6 cu. yd. Grading operations, including minor blasting, rooting, loading, placing, and the travel of track-laying tractors over the material while loading and placing in 6" to 12" layers, reduced the sandstone to a stable sand fill without the use of any special equipment.

"How 340,000 Cu. Yd. of Sandstone Was Excavated With Rippers and Scrapers;" *Roads and Streets*, February.

## CUT WIDENING COSTS



## NO FORMS REQUIRED

Widen roads with concrete (as shown here) or bituminous mix and do away with costly forms. The versatile APSCO also handles up to 3" base paving material, gravel, etc. *It means real saving!* The wise contractor uses APSCO equipment — wideners, base pavers, trench rollers. Send for free full line catalog!

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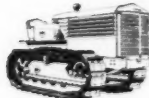


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**SAFETY.** No cables to break . . . no slipping brakes. Safety feature in hydraulic system reduces wear and tear on engine. Engine speed seldom has to go beyond idling.

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Sup't., Highway Maintenance Division,  
Cincinnati, O.

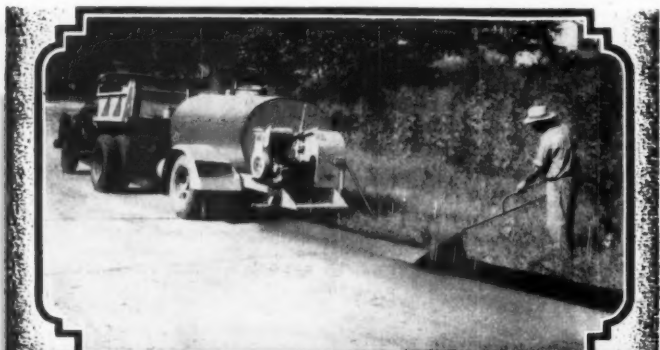
*This is an abstract of a paper  
by Mr. Brokaw at the American  
Road Builders' Association.*

**O**NE-WAY radio communications were installed in our highway maintenance organization early in

1938. The original installations, tuned to receive messages from the Police Department transmitter, were made in the automobiles of our eight district inspectors who are charged with the responsibility of inspecting the opening and restoration of streets and sidewalks, tapping of sewers, investigation of complaints, and reporting of street

defects. This resulted in more effective inspection with a minimum of delay to contractors who always find it difficult to forecast the exact time at which particular operations will take place.

The Highway Maintenance Division of the Department of Public Works of the City of Cincinnati employs 580 persons in street and sewer maintenance and cleaning, bridge and culvert repair and maintenance of traffic control devices. The City of Cincinnati extends over an area of 74.3 square miles with maximum dimensions of 11.2 miles north — south and 18.6 miles east-west. Our organization works out of six strategically located work yards.



### STANDARD STEEL "S-J" for PATCHING—PRIME COAT—SEALING— SHOULDER REPAIR and CRACK FILLING

*Built to* **Standard** *The Highest*

#### Compare These Special "S-J" Features:

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- 2 **PIPING and PUMP** are automatically drained after finishing a job! This prevents "freezing" or slow start on heavy materials!
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★ For year round use—Standard Steel "S-J" Maintenance Distributor can be used either for emergency or secondary construction work.

The most adaptable piece of road equipment you can buy, the "S-J" performs many duties of heavier machines — such as building drives, alleys, playgrounds, parking areas, shoulders, reshaping curves as well as patching and sealing. Quick to start and get going, fast on the job, the low cost of this equipment will be paid for in reduced construction and maintenance cost in a single season. Get the facts and cost on the "S-J" before you invest in any similar equipment.

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#### **Advantages of Radio Equipment**

The advantages of the radio equipment were so evident that by June, 1938 we decided to install radio receivers in all of our emergency vehicles and in the automobiles assigned to key supervisory personnel. Installation of radio equipment in our two emergency trucks which respond 24 hours per day to street and sewer emergencies markedly increased their efficiency as did the installations in the special trucks of two mobile sewer cleaning crews. As we were able to install radio receivers in the vehicles of supervisory personnel, we really began to appreciate its value as an aid to supervision. However, we also became acutely aware of the limitations of a one-way radio communication system whose messages must be sandwiched between the increasing volume of high priority police calls. Plans were accordingly formulated for a 2-way radio net with a transmitter independent of the police radio system and, of course, at a different frequency.

A two-way radio system on a frequency of 37.9 megacycles was placed in operation October 27, 1949 for joint use of the Highway Maintenance Division and the Water Works Department, with a central operating point at our major work yard. All communications procedure is in accordance with the established rules of the Federal Communications Commission. At the present time, we have fifteen vehicles equipped with two-way radios and fifteen passenger cars still equipped with receiving sets only. The assignment of two-way radios is as follows:

**State Highway Departments  
Handle More Material Faster  
WITH EAGLE LOADERS**



### 3 TO 5 YARDS PER MINUTE

From stock pile to dump truck at a rate that can keep a fleet of trucks busy . . . 28 fast moving buckets dump onto conveyorized discharge chute that swings in 180° arc. Especially useful in picking up window dirt or any loose material and snow.

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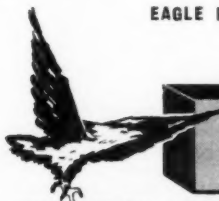
After loader is "on location" driver steps to running board where full hydraulic control of both loader and truck are within easy reach. Operator has best possible vision for safe, accurate, efficient operation of loader.

### JOB-TO-JOB AT TRUCK SPEEDS

Speedy mobility is more important than ever—around the yard or from place to place. Means appreciable savings in total when you consider idle time of equipment and personnel. In many cases one quickly portable machine does the work of two or three less mobile units.

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24 hour all purpose	2
Emergency Trucks—	
Sewer Serv. 8 hour	2
Asst. Superintendent—	
Passenger Vehicle	1
Equipment Dispatcher—	
Passenger Vehicle	1
Field Supervisors—	
Passenger Vehicle	5
Field Gen. Foreman—	
Passenger Vehicle	4

Vehicles equipped with radio receivers only are still assigned to street restoration inspectors and the balance of our general foremen. We hope to complete the installation of two-way radios in the vehicles of all supervisory personnel this year.

The cost of installation per car averages \$600; and the annual cost of operating each 2-way radio receiver is \$554 or about 27¢ per hour.

Two-way radio communication has permitted tightening of our organizational control and has reduced transportation lost motion. The following incidents are illustrative of our favorable experience with two-way radio control.

#### Illustrative Incidents

A sewer cleaning crew in a northern suburb was ordered by the

dispatcher to a reported cellar flooding in a western area. The sewer cleaning general foreman, already in the west on another assignment heard the message and requested the crew to move to its next scheduled location until he investigated the reported cellar flooding. The investigation disclosed that the trouble had already been located by a plumber and that the City was not involved. Saving: 12 miles and a crew hour of time.

During a storm, pavements in the basin area were not slippery whereas pavements in the north and west were becoming hazardous. Prompt investigation of these critical areas by general foremen who lived in the vicinity and block by block reporting by means of radio permitted determination of the location and sequence of operations.

Observation of a badly sunken utilities cut on a main traffic artery by a radio equipped general foreman resulted in the dispatching of a nearby emergency truck and filling of the low area within an hour probably preventing property damage or a vehicle accident.

A supervisor on his way home intercepted a message from the dispatcher ordering the emergency

truck, then in the east, to investigate a flooded cellar in the north. The supervisor investigated the complaint himself, cleared up the trouble and radioed the emergency truck in time to prevent a trip of fourteen miles in rush hour traffic.

A crew repairing a pavement with sheet asphalt experienced difficulty in laying the material which indicated an improper mix. A radio call by the general foreman brought the supervisor to the scene for issuance of corrective orders to the municipal asphalt plant in time to prevent a repetition of similar problems elsewhere.

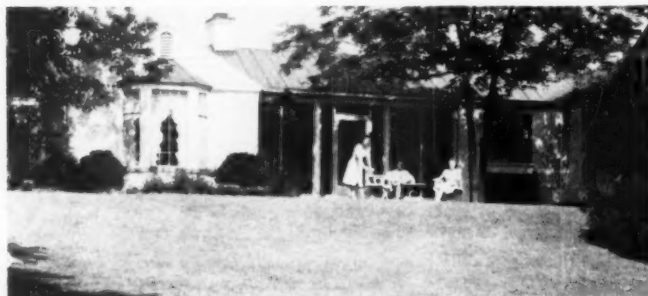
A freezing rain caused a large street tree to fall, completely blocking the street and pulling down several high tension electric power wires. A radio call to a general foreman brought him to the scene in time to assist the police in temporary rerouting of traffic, in addition to appraising himself of the problem and radioing for the personnel and equipment necessary to remove the obstruction.

A crew engaged in filling an old tunnel which had caused the undermining of a first priority artery experienced difficulties in consolidating their backfill because of a number of obstructions in the tunnel opening. A radio call by their general foreman brought a supervisor who suggested and arranged for a mudjack, a complete answer to the problem of immediate filling and compaction of the settled subgrade area.

A truck dispatched from an isolated sewer repair job for a specified list of materials was well on its way before excavation revealed that additional sewer pipe would be required. No telephone was nearby but the general foreman saved time and money by intercepting the truck at the yard by means of a radio flash to the central yard.

We have never had complete success in getting satisfactory reporting of street defects. With a radio transmitter available to persons in vehicles the number of reported street hazards and defects has markedly increased, resulting in a reduction of traffic obstructions and hazards caused by utility and pavement failures.

We believe that our limited experience with partial two-way radio communications, satisfactory as it has been, has only scratched the surface of its possibilities. We anticipate a very definite increase in the efficiency of normal maintenance operations through more effective routing of vehicles; better coordina-





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tion in related operations, as pavement excavation and restoration, street sweeping and flushing, concrete pouring, bituminous paving; and more effective control by supervision. In the case of slippery street emergencies the constant patrol of an assigned area by a foreman in

a radio equipped car will insure the most effective and economical spreading of anti-skid materials. When river floods and similar emergencies occur in which unusual activities are necessary, we look forward to considerably smoother and more efficient operation.

## Streambank Plantings for Erosion Control

**E**ROSION of streambanks can be prevented in many cases by appropriate plantings, though larger streams and those with swift currents may require riprap or other masonry protection. The data in this article, which is based on a publication of the U. S. Department of Agriculture prepared by Frank C. Edminster, refers primarily to the northeastern states.

When banks have been eroded and undercut, they should be graded before planting. In firm soils, the finished slope may be 1 on 1; in light soils it should be 1½ on 1. Where the amount of work is considerable, equipment should be used for the grading.

Three kinds of shrubs are adopted for planting on streambanks. The one used to cover all of the bank, except possibly at the edge of the water surface, is the purple-osier willow, a shrub having the scientific name *Salix purpurea*. Dogwood is another good shrub and does a little better at the water line. Either silky dogwood (*Cornus amomum*) or red-osier dogwood (*Cornus stolonifera*) is suitable. For protecting the stream bank from domestic animals or for other reasons a single row of multiflora rose may be planted at least 4 ft. back from the top of the bank. Where the bank is higher than 4 ft., the row should be planted as far back

from the bank top as the bank is high. The rose seedlings are set a foot apart.

It takes 3 years or more to grow a living fence of multiflora rose. Therefore if immediate protection of the streambank plantings is required, a wire or other fence will be necessary. This should be set about 2 ft. farther back than is indicated for the multiflora rose fence.

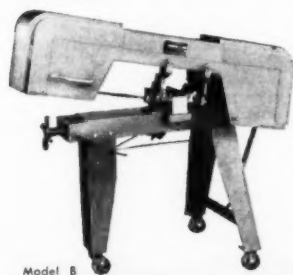
### Planting Stock and Planting Methods

Purple-osier willow is best planted as rooted 1-year old cuttings, but fresh hardwood cuttings from old plants may be used. Planting stock should be obtained just before planting. These should be 3/16 to 1/2 inch thick and 8 to 12 inches long. Poles of purple-osier willow can also be used. Silky dogwood should be 1-year old nursery grown seedlings. Roots should be at least 8 inches long and the stems should have a diameter of at least 1/8 inch. Red-osier dogwood may be planted either as 1 year seedlings or as fresh hardwood cuttings.

Early spring is the best time for planting. The survival of seedlings which have leaved out is likely to



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Model B

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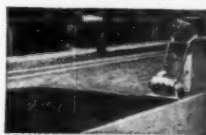
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Can work flush to any edge



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### WAYER IMPACTOR

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be low, so that planting should be completed by mid-spring. Fresh cuttings and poles may be planted successfully until early summer. Fall planting is successful only in sandy or sandy loam soils.

The willows and dogwoods are set 2 ft. apart in rows which are also 2 ft. apart. One row of dogwoods is suggested along the water line, with as many rows of purple-osier willows as are necessary to cover the bank. Where willow poles are used, it is better to bury them in the bank, at right angles to the stream, and 2 ft. apart with the

butt ends in the water. They should be staked or tied down.

Seedlings and rooted cuttings are best planted with a mattock or pointed shovel. Fresh cuttings can sometimes be pushed into the soil by hand, leaving only the tip above ground. If the soil is stony, a 1/2-inch steel bar can be used to form the hole, which should be just deep enough to hold the whole cutting, which should be firmly tamped at the tip.

#### Maintenance

Newly planted banks are usually bare and subject to further erosion.



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Plantings alone will not prevent further damage for at least 2 years. A mulch of hardwood or evergreen branches is desirable. This should be heaviest on outside banks of the stream where the current strikes the bank. Since high water will float the mulch it should be tied down. Chicken wire and stakes, or No. 9 wires laced between stakes, are suitable. Fresh alder brush, cut and placed in the early fall when it contains ripe seed, is excellent mulch, as the seeds germinate and help make a living cover. Tree willows should not be used for stakes as they may take root and must then be cut out. Mulch should normally be placed in sufficient amount to make a fairly solid mat 6 inches thick when packed.

Repairs will be needed every year or two. Banks should be examined each spring after high water has passed, and gaps should be filled. Trees that have taken root on the sloped banks should be cut or pulled, if small.

#### Potomac River Pollution Problems

It is estimated that the Potomac River from Hains Point in Washington to Fort Belvoir, Va., will assimilate a pollution load equivalent to that of 475,000 population during low summer flows and maintain itself in a satisfactory condition. The present population of the Washington Metropolitan Area is about 1,400,000. Present treatment handles the wastes of about 400,000 people, leaving an overload on the river of about 525,000. It is estimated that the area population will reach 1,940,000 by 1980 and that it will then be necessary to have treatment facilities capable of removing 75% of the BOD of the area wastes. These data are from a paper by Harold A. Kemp, Director of Sanitary Engineering for the District of Columbia, which was presented at a recent ASCE meeting.

#### Richmond, Va., Dedicates New Water Plant

The new water purification plant of the city of Richmond, Va., was dedicated on March 15. Considered the most modern facility of the kind in the world, this new plant is very much the product of the genius of Marsden Smith, long in charge of the plant and now Chief Engineer of the Department of Public Utilities.

PUBLIC WORKS  
DIGESTS

## THE WATER WORKS DIGEST

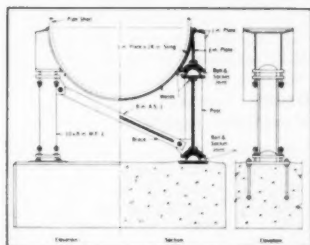
### Redeveloping Wells by Explosives

To restore the productivity of some of its wells, the Southern California Water Co. tried back-washing, use of air lift, dry icing, acidizing and swabbing. Only swabbing gave beneficial results and these were very short-lived. Trying the use of explosives, it has developed a practical method which, it is satisfied, will go far toward solving the problem. In this, called the vibratory-explosive method, a series of selected explosives are spaced on various leads and fired at specified intervals of time throughout the length of the perforated area. The explosives produce a continuing series of shock waves safe to use in various casings yet powerful enough to shatter and dislodge obstructions in the perforations or in the interstices of the surrounding formations. Formulas have been developed for calculating explosive force which can be applied to the function desired.

R. M. Ebaugh—"Water Well Development by Explosives"; *Journal American Water Works Ass'n*, February.

### Laying Pipe Above Ground

Of the 94 miles of the Mokelumne aqueduct, 10½ miles is twin lines of steel pipe laid above ground because the soil is of peat with the ground water near the surface. One of the twin lines was laid in 1928, the other in 1949. In designing the latter, advantage was taken of experience with the former and of recent methods of construction. The older line contained two welded longitudinal seams, and the circumferential joints were riveted; in the new line all joints are welded except at expansion joints. The older was protected by a bituminous coating inside and out; the newer by cement mortar inside and aluminum paint outside. Both have expansion joints, generally 2600 ft. apart in the older and 922 ft. in the newer. The former had vertical supports 30 ft. apart, the latter 60 ft. Both are anchored midway between expansion joints. In the old line the



Courtesy Journal AWWA

### ● STEEL support for laying pipe above ground.

anchors consisted of masses of concrete encompassing the pipe, supported on wood piles, and the vertical supports were wood saddles supported by reinforced concrete bents on wood piles. In the new line, reinforced concrete piles replaced wood; and a steel strap sling was used at vertical supports, hung to a 2-post braced steel bent which is supported by a reinforced concrete pile bent.

The most radical change was in these supports. The steel bent posts have a ball and socket joint at top and bottom of each post to permit longitudinal motion due to temperature changes, calculated to reach a maximum of 4¾" at each support between maximum and minimum temperatures. The piles are battered 2.6:12 longitudinally and 1.5:12 transversely, and carried to firm soil at a maximum depth of 20 ft. The new features of this above-ground section added \$500,000 to the cost, which totaled \$3,900,000, but the lower maintenance cost and superior quality is considered ample justification.

James W. Trahern—"Aboveground Pipeline Sections of Mokelumne Aqueduct"; *Jour. American Water Works Ass'n*, February.

### Recarbonation With Liquid CO<sub>2</sub>

A number of small softening plants have adopted dry ice as a source of carbon dioxide for stabilization in recent years. It is very expensive to provide storage facilities for this material, and the possibility of frequent deliveries from nearby sources is an important con-

sideration. In February, 1947, the Cardox Corp. began a regular service of supplying the Minneapolis softening plant with liquid carbon dioxide, shipped in tank cars containing approximately 48,000 lb. of liquid and gas under a pressure of about 300 lbs., which is transferred to two 40-ton storage tanks insulated with 6" of pressed cork, each provided with a unit which converts the liquid into vapor. This vapor is withdrawn at a temperature of about 0° F. and is heated to 50° F. It is proportioned as required by three rotameters and passes into diffusers using porous 1½" cotton fabric hose. The author believes it is safe to forecast that the trend will be increasingly away from carbon dioxide produced at the softening plant and toward the use of dry ice or liquid carbon dioxide where frequent deliveries of small shipments can be made reliably.

Arthur F. Mellen—"Recarbonation With Liquid Carbon Dioxide"; *Jour., American Water Works Ass'n*, February.

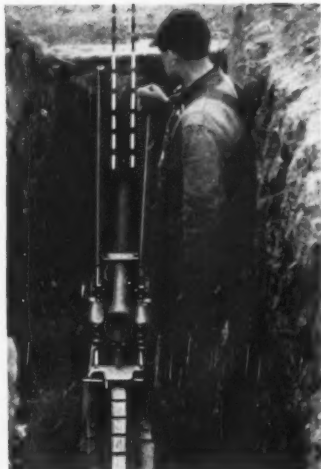
### Correcting Reservoir Leakage

Leakage of more than 450 cfs around the ends of a concrete dam at Great Falls, Tenn., was reduced 98% by injecting hot asphalt and cement into 608 holes drilled along a cutoff line almost a mile long. The leakage channels were in horizontal strata of limestone. The inlets extended 10,000 ft. upstream from the dam, and the outlets only about half this distance downstream, and the correction work was confined to the latter. The 3½" holes were located about 60 ft. back from the face of the bluff, and either asphalt grout or portland cement grout was injected. Where leakage existed at all reservoir elevations, asphalt was used; where there was no leakage at low reservoir stages, portland cement was considered practicable. When the reservoir filled, all asphalt-grouted leaks remained closed; cement-grouted holes on 40 ft. centers were 80% effective, on 20 ft. centers were 95% effective, and on 10 ft. centers were practically 100%. A cement-grouted

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hole was placed on each side of an asphalt-grouted one with the idea of incasing it with cement and plugging small openings which the asphalt might not penetrate. Three years after this work had been completed, the only leakage was in the form of seepage.

A. H. Weber—"Correction of Reservoir Leakage at Great Falls Dam;" *Proceedings, Am. Soc. of Civil Engineers*, January.

### Double Use of Municipal Supply

Brownsville, Tex., has completed the first quarter of a 20 mgd municipal water supply and treatment system to cost \$3,500,000. The new supply will be about 10% of that which is drawn from the Rio Grande and used as cooling water in a municipal power plant. The water is first desilted in impounding reservoirs and used as cooling water, after which 10% of it is carried by canal 5 miles to a 5 mgd conventional purification plant, where it enters a 30 mg raw-water reservoir. The treatment consists of aeration, application of alum, hydrated lime and activated carbon, mixing, flocculation, sedimentation, rapid sand filtration, pre- and post-chlorination. A 16" main will carry the purified water to the two existing 12" transmission mains.

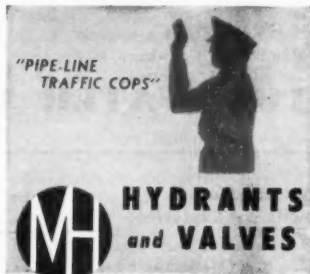
"More Water for Industrial Expansion;" *Engineering News-Record*, March 2.

### Proposed Incodel Water Supply Development

Engineers for the Interstate Commission on the Delaware River Basin (Incodel) made a preliminary report in January, recommending a plan which would produce 2,000 mgd to satisfy all foreseeable water needs for the next 50 yr., regulate stream flow to hold down pollution and foster industry, better navigation and improve recreational use of the Delaware and its tributaries. The cost was estimated to be \$940,000,000, \$540,000,000 for an immediate partial development. The project includes the building of 7 reservoirs for storage and one for diversion; with a 17-mile concrete-lined tunnel having 6200 cfs capacity, and a 65-mile tunnel of 1250 mgd capacity bringing a supply to New York City and Northern New Jersey. Plans also provide for bringing 1200 mgd to Philadelphia and intermediate cities.

The Delaware river basin has an area of 13,000 sq. mi. the sparsely

PUBLIC WORKS for April, 1950



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populated upper third of which gets 40" to 50" of rainfall yearly, of which 53% runs off. The flow at Trenton has fallen to 1,220 cfs, at which rate salt water has backed up to Philadelphia, causing increased cost in treatment and damage to plants of industry and cities. It is proposed to maintain a minimum of 4,000 cfs at Trenton, which would also reduce pollution. It would also be possible to install four hydroelectric plants with a combined capacity of 31,370 hp.

Arthur J. Fox, Jr.—"Delaware Seen as Best Answer to Four-State Water Demand;" *Engineering News-Record*, Feb. 2.

### Disposal of Radio-Active Wastes

There is a certain natural concentration of radio-active materials throughout the world that will always be present and to which man has always been exposed. The problem is to avoid artificial exposure which exceeds safe limits. The exact limits of tolerance can not be known with absolute certainty until more biological and physiological data have been obtained by researches being conducted by Atomic Energy Commission, U.S.P.H.S. and various educational institutions. As to removal of fission products by water treatment plants, it is possible to determine the efficiency of standard purification processes in removal of a given mixture, but this might not be applicable to all contaminants; and a considerable proportion, even 90%, may be removed by adsorption by the coagulant, which remains to be disposed of. Removal of fission products from water is being studied by the Mass. Inst. of Tech., adsorption and assimilation by bacterial slimes by Johns Hopkins, and waste disposal in sewers by New York University. It is believed that understanding will proceed rapidly because everyone concerned is very conscious of the problems involved and a concerted effort is being made to solve them.

O. R. Placak and R. J. Morton—"Research on the Disposal of Radio-active Wastes;" *Journal American Water Works Ass'n*, February.

### Optimum Incubation Temperature

The optimum temperature for the growth of *Escherichia coli* and other members of the coliform group has been considered to be 37° C. Investigation was made to determine

whether the optimum temperature for the growth of coliform organisms in their normal habitat is also the optimum temperature for growth and fermentation after they have existed for some time in water at temperatures normally much lower than 37° C. It was concluded that the most favorable incubation temperature for the primary isolation of coliforms from water is 35° C.; and that incubation at 32° C. for primary isolation is superior to 37° C., although a longer incubation period is necessary at 32° than at 35°.

Joanna R. Boniece and W. L. Mall-

mann—"The Optimum Incubation Temperature for the Primary Isolation of Coliform Organisms;" *Journal American Water Works Ass'n*, February.

### Cement-Lining Pipe With an Upside-Down Truck

A Rhode Island contractor has cement-lined 10,000 ft. of reclaimed 24" cast-iron pipe by centrifugal depositing of the mortar, the high-speed rotation of the pipe being effected by means of a 6-wheel truck chassis turned upside down. The pipe was placed between the two pairs of rear wheels, the engine and



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gears having been remounted to provide the necessary high-speed rotation. Two idler wheels on each of two arms hold the pipe on the wheels during spinning. The mortar was placed in the pipe by means of a trough made by splitting lengthwise a 20-ft. length of 6" pipe. The desired amount of mortar was placed in the trough, which was then pushed into the pipe and turned upside down. The pipe then was revolved at 400 rpm for five or six minutes.

L. F. Booth—"Upside-Down Truck for Lining Pipe;" *Engineering News-Record*, Feb. 16.

### Steel Tanks Provide Safety From Earthquakes

Long Beach, Calif. is subject to earthquakes, and also to ground settlement due to removal of oil from the ground below. For this reason, plans made 20 yrs. ago for a reinforced concrete reservoir were abandoned and 6 steel tanks erected instead. This spread the risk over more structures, and as the soil settles, each tank can settle as an independent structure. These tanks passed through the 1933 earthquake without damage. Tierods extend radially from a central col-

umn to the upper rim of the tank to make it a rigid structure. Twelve more tanks are now under construction, 132 ft. in diameter and 35 ft. deep, each having 20 rods for stiffening the top. They are covered with roofs of treated lumber.

"Steel Tank Farm as City Reservoir;" *Engineering News-Record*, Feb. 23.

### Titration For Total Hardness

A rapid and accurate determination of the total hardness of water can be made by titrating the water with sodium versenate (the disodium salt of ethylenediaminetetraacetic acid). At a pH of 10, calcium and magnesium form negligibly ionized compounds with sodium versenate. The endpoint is found by the addition of a blue dye (F241) which also forms an undissociated, wine-red compound with magnesium but from which the magnesium is extracted by an excess of sodium versenate. The titration can be applied to waters ranging from very low to very high hardness. Large concentrations of salts do not interfere and temperature has little effect. Copper, iron and certain other bivalent metals interfere with the endpoint,

but their effects can be eliminated by the addition of various complexing agents, which are conveniently added with the indicator. The method has been adequately tested and is suitable for use by untrained operators. With slight modification the method can be applied to the analysis of water of very low hardness.

The method may be combined with the oxalate separation of calcium to give a rapid method for the separate determination of calcium and magnesium hardness.

Harvey Diehl, Charles A. Goetz and Clifford C. Hach—"The Versenate Titration for Total Hardness;" *Journal Am. Water Works Ass'n*, January.

### Illegal Diversion Of Water Department Funds

What use of water department funds is illegal depends, of course, on the law. For example, in Ohio it is illegal to purchase fire hydrants from water funds (they should be charged to the safety appropriation in the general fund); or to borrow from the water fund for other municipal purposes; or to furnish water free to churches, parochial schools, YMCA, Boy Scouts, etc.

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It is illegal to classify employees in other departments as waterworks employees, to charge the water department excessive rental for space in city-owned buildings. Diversion is sometimes made legal by legislative enactment, as for the operation of a sewage treatment plant.

**J. E. Gotherman**—"Illegal Demands of Water Department Funds;" *Journal American Water Works Ass'n.*, February.

## Well Water and Methemoglobinemia

Since January 1947, 139 cases of methemoglobinemia, including 14 deaths, due to nitrate nitrogen in farm well water supplies, have been reported in Minnesota. In all but 2 of the cases investigated the nitrate nitrogen content of the water was in excess of 20 ppm, but because the concentration may be increased by boiling, 10 ppm has been established as the point above which the water should be viewed with suspicion.

**H. M. Bosch, A. B. Rosenfield, Roberta Huston, H. R. Shipman and F. L. Woodward**—"Methemoglobinemia and Minnesota Well Supplies;" *Journal American Water Works Ass'n.*, February.

## BIBLIOGRAPHY

### American Society of Civil Engineers Proceedings

Correction of Reservoir Leakage at Great Falls Dam. By **A. H. Huber**, Constr. Engr., T.V.A., January, Pp. 101-118.

**American Water Works Ass'n. Journal**  
Obtaining Technical Services for Small Communities. By **Thomas M. Niles**, Cons. Engr., February, Pp. 107-112.

The Consulting Engineer and the Water Works Operator. By **Donald J. Hettler**, Engr., Supt. of W. W., Alliance, O., February, Pp. 113-117.

Organization and Financing of Maryland Sanitary Districts. By **J. Alvin Pasarew**, Dir., State Plan. Com., N. L. Smith and A. B. Kaltenbach, Baltimore Co., Dept. of Pub. Wks., February, Pp. 118-126.

Public Authorities in Pennsylvania. By **J. Raymond Holbert**, Chf. Engr., St. Dept. of Health, February, Pp. 127-134.

Research on the Disposal of Radioactive Wastes. By **O. R. Placak**, U.S.P.H.S., and **R. J. Morton**, Oak Ridge Nat'l Laboratory, February, Pp. 135-142.

Illegal Demands on Water Department Funds. By **J. E. Gotherman**, Ohio State Auditor's Office, February, Pp. 143-145.

Pennsylvania's Clean Streams Program. By **Howard E. Moore**, Chf. Engr., State Dept. of Health, February, Pp. 146-150.

Developments in the Chlorine Dioxide Process. By **R. V. Aston**, Mathieson Chem. Corp., February, Pp. 151-154.

The Optimum Incubation Temperature for the Primary Isolation of Coliform Organisms. By **Joanna R. Borecz**, Mich. Agri. Exp. Sta., and **H. L. Maffman**, Prof. of Bacteriology, Mich. State College, February, Pp. 155-160.

Methemoglobinemia and Minnesota Well Supplies. By **H. M. Bosch, A. B. Rosenfield, Roberta Huston, H. R. Shipman and F. L. Woodward**, State Dept. of Health, February, Pp. 161-170.

Well Water Redevelopment by Explosives. By **R. M. Ebaugh**, Supt., So. Cal. Water Co., February, Pp. 171-185.

Infiltration Gallery at Ontonagon. By **George H. Francis**, Cons. Engr., February, Pp. 186-188.

Aboveground Pipeline Sections of Mokelumne Aqueduct. By **James H. Trahern**, Engr.,

East Bay Munic. Utility Dist., February, Pp. 189-198.

Pipeline Location and Right-of-Way Problems. By **Carl A. Lancaster**, Constr. Engr., Water Dept., San Francisco, February, Pp. 199-203.

Recarbonation With Liquid Carbon Dioxide. By **Arthur F. Meller**, Supt. of Water Treatment, Minneapolis, Minn., February, Pp. 204-206.

History of Water Supply in Russia. Review of book by **N. I. Fulkowski**, February, Pp. 207-208.

### Engineering News-Record

Upside-Down Truck for Lining Pipe. By **L. F. Booth**, V. P., Rome Construction Co., Feb. 16, Pp. 35.

Steel Tank Farm as City Reservoir, Feb. 23, Pp. 36-37.

More Water for Industrial Expansion, March 2, Pp. 38-40.

### New England Water Works Ass'n Journal

Casual Observations of English Water Works Practice. By **E. Sherman Chase**, Cons. Engr., December, Pp. 315-324.

Design and Construction of Perry Bar Service Reservoir. By **C. A. Rishbridge**, December, Pp. 325-358.

### Public Works

90-Inch Pipe Line Brings Water to Denver, March, Pp. 32-33.

Building a Concrete Reservoir With Sectional Forms. By **Jack H. Geisler**, Irvington Form & Tank Corp., March, Pp. 40-41.

### Water and Sewage Works

Operating the Water Distribution System. By **H. Victor Heir**, Pres. St. Louis Co. and Mo. Water Co., February, Pp. 83-84.

Fundamentals of Corrosion and Its Mitigation. By **E. W. Moore**, Assoc. Prof. San. Eng., Harvard Univ., **H. H. Sears**, Mech. Engr., Metr. Dist. Water Supply Com'n., and **L. Rubin**, Chf. of Lab., Mass. Dept. of Health, February, Pp. 85-88.

Water Works Planning from a Commissioner's Viewpoint. By **H. E. Fairhurst**, Comm. of Pub. Wks., Hawthorne, N. J., February, Pp. 89-90.

Improving the Water Supply of Sydney, Australia. By **H. Bowden Fletcher**, March, Pp. 95-100.



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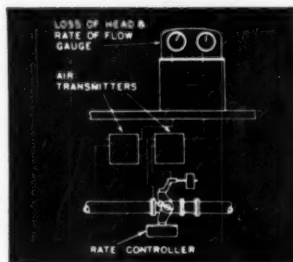
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New York's Delaware Water Supply Being Pushed Ahead. March, Pp. 106-108

Water Treating Experiences: Handling Medium Soft River Water at Fort Smith, Ark. By A. H. Ulrich, Supt. of Water & Sew. Treatment, Austin, Tex. March, Pp. 109-110.

Operation of Small Water Plants: The Distribution System. By A. E. Clark, Gen. Mgr., Nashville Suburban Utility Dist. March, Pp. 111-112.

Industrial Water Supply. By Geo. W. Reid, Assoc. Prof. of Civ. Eng., Georgia Inst. of Technology. March, Pp. 113-114.

#### Water Works Engineering

Mains Above Ground in Spite of Forty Below Zero Weather. By Walter Redman, Chf. Fire Dept., Film Plan, Man. February, Pp. 120-122, 158.

## Consulting Engineers Report On New Engineering Projects

### WATER WORKS IMPROVEMENTS

**B**IDS have been called for a 7.5 MGD filtration plant for Mansfield, Ohio, designed by **The Jennings-Lawrence Co.** of Columbus.

**Rollin F. McDowell**, Cleveland, Ohio, has prepared plans for water works improvements for Bridgeport, Ohio. **Weston & Sampson**, Boston, acted as consultants for Claremont, N. H., where the height of an existing water supply reservoir dam was raised. **Wilson & Co.** of Salina, Kansas, has designed a 3 MGD water softening plant for Hays, Kansas. This unit completes the development of a new water supply including wells and pipeline. Improvements to the water system of Arcola, Ill., including zeolite softening, were engineered by **Wilson & Anderson** of Champaign, Ill.

**Bannister Engineering Co.**, St. Paul, Minn. have started plans for water supply improvements, interceptor sewers and sewage treatment plant for Two Harbors, Minn. and for water plant additions at Mankato, Minn. Bids have been called for a water plant and distribution system for Meredosia, Ill., planned by **Casler & Stapleton**, Jacksonville, Ill. **Garrett Engineering Co.** of Houston are consultants for a fully-equipped swimming pool for Cleveland, Texas. Plans for a Water District for the Town of Cortland, Westchester County, N. Y., are being prepared by **J. Wilbur Irish**, Peekskill, N. Y. **Emerson D. Wertz & Assoc.** of Bryan, Ohio, are working on water works improvements for Archbold, Ohio. Additional supply, treatment and overhead storage for Greenville, Ohio, are being engineered by **Ralph L. Woolpert Co.** of Dayton, who are also conducting a comprehensive survey of the Oakwood, Ohio, water works.

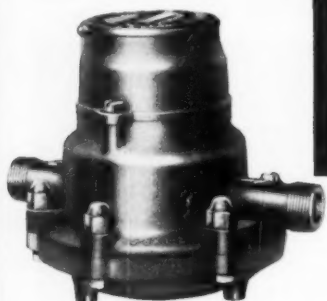
Swimming pools planned by **Wayne A. Becker** of Cincinnati include one for a Cincinnati playground; and a pool, filter plant and bathhouse for the Town of Greendale, Lawrenceburg, Ind.; also for the water supply, treatment, and pool at the Delphi, Ind., State Y.M.C.A. Camp. A plan to provide water supply and waste water disposal at French Creek State Park, south of Pottstown, Pa., is being studied by **Birkinbine Engineering Offices**, Philadelphia. **Floyd G. Browne & Associates** of Marion, Ohio, report completion of a study to improve the municipal

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water system of Wellington, Ohio. A proposed filtration plant and supply line is being planned by **Russell & Axon**, St. Louis, Mo., for the city of Lawrenceburg, Kans.

An engineering report on enlargements for the water supply system of Reynoldsville, Pa., has been submitted by **Michael Baker, Jr., Inc.**, of Rochester, Pa. Plans for water works improvements including a 45-ft. high earth fill dam, filter and pumping plant additions and main extensions for Morehead State College, Ky., are being prepared by **Howard K. Bell**, Lexington, Ky. The **Caldwell-Rhoads Co.**, Jacksonville, Ill., reports that complete water works systems including wells for supply have been planned for the villages of Cisco, Fithian, Hanna City, Mill Shoals and Tower Hill. Ill. Bids on these projects will be called during the spring. **Winston Cooper Engineering Co.**, Montgomery, Ala., is consultant for a storage reservoir dam for the supply of Cullman, Ala. Two elevated tanks, extensions to distribution system and sewage collection system, and a sewage treatment plant are part of the improvements planned for Snyder, Texas, by **Jas. V. Curnette**, San Antonio, Texas. In addition a paving and drainage program is under way. Plans and supervision of construction for a reservoir, pipeline and 1.1 MGD pumping plant for Walsenburg, Colo. are being handled by **Douglass, Corey & Fisk Engrs. Inc.**, of that city. **Boyd E. Phelps, Inc.**, Michigan City, Ind., reports that plans are being prepared for water works improvements for the cities of Crown Point, Ind., and Vincennes, Ind. Bids will be received in the late spring for new wells, supply line and distribution system improvements for Farmersburg, Ind. **J. B. Wilson** of Indianapolis is consultant.

## ROAD AND BRIDGE WORK

**S**ERVIS & Van Doran of Hays, Kansas, are consultants for a pavement, curb and gutter, and storm sewer construction program for Larned, Kans. **Parsons, Brinckerhoff, Hall & McDonald** report plans under way for two bridges and an overpass in Jacksonville, Fla., estimated cost \$12 million; also the Arthur Kill Bridge which will be the longest railroad vertical lift bridge. Road work planned by this company includes a distribution road in and around Lynchburg, Va., and a western extension of the Pennsylvania Turnpike.



A city-wide paving program and general improvement of street facilities for Plainview, Minn., is planned by **Hitchcock & Estabrook, Inc.**, Minneapolis, Minn. This firm has handled the engineering planning for Plainview for more than 20 years. **Alfred Tamm**, Harlingen, Texas, is consultant for Cameron Co., Brownsville, Texas, for the design of a causeway from Port Isabel to Padre Island. Advance planning for a city-wide street improvement program for Port Arthur, Texas, is reported by **Chas. P. Smith Associates**, Orange, Texas and **George Schaumburg**, Beaumont, Texas. This six or eight-year program is estimated to include 110 miles of new pavement, 15 miles of resurfacing and 26 miles of storm sewers.

### SEWERAGE AND REFUSE

**A** SANITARY sewerage system with primary treatment for Stockdale, Texas, (1500 population) has been designed by **Frank P. Drought**, San Antonio who is also consultant for the civic improvements planned for Laredo, Texas, to include a sanitary sewerage system, storm sewers, bridge approaches and paving. A new sewage treatment plant of the activated sludge type for Bay City, Texas, and extensive additions to the water works system of the same city are planned, with **Garrett Engineering Co.** of Houston as consultants. Plans are underway for a sewage treatment plant and intercepting sewers, estimated to cost \$1,200,000, for West New York, N. J. **Frank J. Oleri** of that city is the consulting engineer. **S. A. Russell** and **Freese, Nichols & Turner** of Rosenberg, Texas, are preparing plans for a county-wide drainage project for Ft. Bend Co., Texas.

A sewage disposal plant for the joint use of Independence and Monmouth, Oregon, is being designed by **R. H. Corey Engineers**, Portland, Oregon. Intercepting sewers and a new treatment plant for Defiance, Ohio, are reported by **Finkbeiner, Pettis & Strout**, Toledo, Ohio. Bids were called in the early spring for a sewerage system, primary treatment plant and pumping station for Auburn, Wash. The consultant is the **General Engineering Co.**, Seattle. A complete sewage treatment plant for Ellsworth, Wisc., is being designed by **Herman T. Hagestad**, River Falls, Wisc., to handle domestic sewage and milk plant wastes. **J. Wilbur Irish** of Peekskill and **Thomas M. Riddick** of New York City are consultants for a 4 MGD

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sewage disposal plant for Peekskill, N. Y. Metcalf & Eddy, Boston and San Francisco, report work on the following projects: plans for sewage collection, pumping and disposal works in the Broadway District of Milford, Conn.; a report on refuse disposal for Long Beach, Calif.; a report on sewage disposal for Plymouth, Mass.; and design of a new water filter plant for Wilmington, Del.

Two projects for the city of Minot, N. D., are being handled by Pfeifer and Schultz, Minneapolis. These are a high-rate trickling filter sewage treatment plant and a complete water treatment and softening plant. Construction is to be started in May. A 10,000 gpm sewage lift pump station and discharge line for Beaumont, Texas, has been designed by George J. Schaumburg of Beaumont. Bove, Albertson & Assoc. of New York City are engineers for two jobs in Connecticut: a treatment plant and outfall sewer for Fairfield and 13 miles of sewers for Plainville. Plans for intercepting sewers and a treatment plant for Mishawaka, Ind., originally designed in 1945, have been modified by Chas. W. Cole & Son, South Bend, to conform with present conditions. Bids will be called for during the spring. Fulton & Cramer, Lincoln, Nebr., are consultants for Central City, Nebr., for the design of a treatment plant and outfall sewer. A new treatment plant and a master plan for an entire sewerage system for Texas A & M College are being prepared by Chas. R. Haile & Assoc., Houston, Texas. Rollin F. McDowell & Assoc. report a projected sewage treatment plant and sewers for Toledo, Ohio. Sewage

treatment plants for two schools, to cost \$434,000, are being planned by John H. Moore of Marion, Ohio.

A mechanically charged and stoked incinerator of 350-ton capacity for Jacksonville, Fla., has been designed by Reynolds, Smith and Hills, of that city. Preliminary studies for a waste treatment plant for Chippewa Falls, Wisc., have been undertaken by Bannister Engineering Co., St. Paul, Minn. Boyd E. Phelps, Inc., Michigan City, Ind., reports work on sewers and a treatment plant for Jeffersonville, Ind., and improvements for the Winona Lake, Ind., plant. Sewage treatment plants for Evergreen, Colo., and Las Animas, Colo., are reported by Ripple and Howe, Denver. Paul A. Uhlmann & Assoc., Columbus, Ohio, are acting as consultants for Lebanon and Wilmington, O., for the rehabilitation and enlargement of their sewage treatment plants.

**AIRPORTS**

Parsons, Brinckerhoff, Hall & McDonald, New York City, are consultants for the improvement of the airport at Albany, N. Y. An existing apron will be resurfaced, access roads will be widened and extended, and a parking lot constructed. Jack D. Salo of Duluth, Minn., reports the design of one-strip airports for Grand Morais, Minn., and Cloquet, Minn. Johnson, Depp & Quisenberry, Inc., Owensboro, Ky., have designed an administration building for the Owensboro-Daviess County Airport.

**OTHER WORK**

Completion of plans for unified river control for the Damodar Valley Corp. has been announced by the Dayton-Morgan Engineering Co. of Yellow Springs, Ohio. Plans include dams, power plants and channel construction. Bids will be let during the spring for a diesel municipal power plant for Wheaton, Minn. Cost is estimated at \$450,000 by R. D. Thomas & Assoc., Inc. of Minneapolis, consultants. This firm also reports additions and improvements to the Watertown, So. Dakota power plant.

**Diesel Training Course by Mack**

A free training course covering diesel truck and bus maintenance is being given by Mack Trucks, Inc. So far schools have been held in Albany, Boston and New York. For information on future schools, write H. W. Dodge, Executive Vice President, Mack Trucks, Inc., Empire State Bldg., New York.

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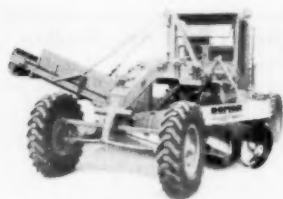
Waterworks, Drainage, Refuse Disposal, Sewerage, Streets, Industrial Wastes

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# PUBLIC WORKS Equipment News

## Motor Grader into Elevating Grader

A product is now available for converting a Caterpillar motor grader into a one-man self-pro-



**Motor grader conversion unit.**

pelled elevating grader. It is claimed that this attachment will give production comparable to a 42-inch pull-type elevating grader, with one-man operation, low upkeep and high mobility. A 30-inch disk plow and a 42-inch carrier, driven by power takeoff from the motor at 400 fpm, are parts of the device. The carrier is 19 ft. long, giving ample heights for loading. Write Ulrich Products Corp., Roanoke, Ill., or use the coupon.

Use coupon on page 93; circle No. 4-1

## Variable Weight 3-Wheel Roller

These new rollers are equipped with ballast-type rolls, which have heavy steel rims welded to steel head plates to form, with the hub, a watertight compartment. Filling and drain plugs are installed in the outer heads to facilitate ballasting. On models which are designed for wet sand ballasting, a shovel opening with bolted watertight head is



**Multi-use roller.**

provided. One variable weight unit covers a weight range equal to three fixed weight rollers. These rollers can be used on finishing work, as well as on subgrades and stone, permitting savings in equipment investment. Full data in Catalog S-60-50, which will be sent on request to Buffalo - Springfield Roller Co., Springfield, O., or by using the coupon.

Use coupon on page 93; circle No. 4-2

## Measuring Water Hardness Easily

Total water hardness and the hardness caused by calcium alone can be measured accurately by simple, easy methods in approximately one minute. This is greatly superior to the old soap test method. It involves a simple, direct titration with a distinct color change. Procedure: Pour sample into dish; add buffer solution; add indicator; add titrating solution. Disappearance of red color marks end point. Full data from Hall Laboratories, Inc., Pittsburgh, Pa., or by using coupon.

Use coupon on page 93; circle No. 4-3

## Ultra Light Weight Self Priming Centrifugal

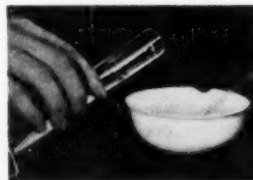
The self-priming portable centrifugal pump has a capacity rating of 15,000 gph, and weighs only 57



**Ultra-light weight centrifugal.**

pounds. It has a 5 hp engine with kick-proof automatic rewind starter; a rainproof ignition system; and an automatic governor. Lubrication is by oil added to the fuel. Pump and engine are mounted on a spring base to provide footing on all types of ground. The pump is made of aluminum; suction lift is said to be 28 ft.; and the impeller is non-clogging. Full information from McCulloch Motors Corp., 6101 West Century Blvd., Los Angeles 45, Cal., or by using the coupon.

Use coupon on page 93; circle No. 4-4



**Pour sample in.**



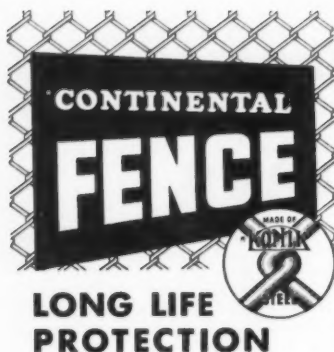
**Add buffer.**



**Add indicator.**



**Get the answer.**



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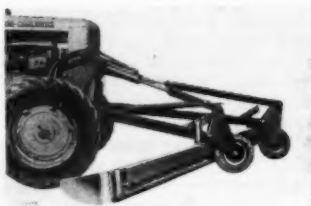
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### Windrow Eliminator for A-C Motor Grader

This windrow eliminator is designed for the Allis-Chalmers Model D motor grader. It is mounted by means of four bolts and 2 pins, welding or cutting being unnecessary. Operation is off the grader hydraulic system. It can be used for many jobs; for instance, on shoulder maintenance, it clears off the excess material piled up along the edge of the road and eliminates the extra trips necessary to clear this off. Other accessory units for the Model D include shovel, V snow plow and bulldozer. The windrow



Eliminates windrows.

eliminator is made by Tractomotive Corp., Deerfield, Ill. Information from them, from Tractor Division, Allis-Chalmers, Milwaukee, Wisc., or by using the coupon.

Use coupon on page 93; circle No. 4-5

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of State Sanitary Engineers show typical State Board of Health requirements and recommendations.

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Plant layouts, tables and design details especially adapted to small plants are included together with money saving suggestions.

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A copy of this booklet will be mailed postpaid promptly on receipt of \$1. Money back if not fully satisfied.

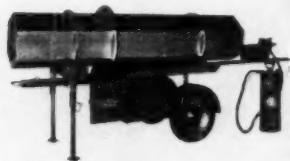


for trenching and for bank shaving, as well as for maintenance, grading, filling and backfilling. Discs are available for bank shaving work. Capacities given above are heaped. The smallest unit (1 yd. struck) is handled with an 18 to 35 tractor; others require larger units, up to 60 hp for the 5-yd. (struck) scraper. These are one-man units. Backhoes and bulldozers are also made by this company. For full information, state equipment interested in, and write Henry Mfg. Co., Inc., 1105 W. 4th St., Topeka, Kans., or use the coupon.

Use coupon on page 93; circle No. 4-6

### Mobile Aggregate Heater for Better Maintenance

This mobile, light aggregate dryer will save time and money on such winter and other maintenance and



Small aggregate heater.

construction as requires hot stone, sand or gravel. The material is shoveled into one end of the drum (loading height 34"); material is mixed and heated by a series of angular tumbling irons; heat is supplied by a kerosene torch. Weighs only 664 pounds and is easily towed. Data from Tarrant Mfg. Co., Saratoga Spgs., N. Y., or we will get it for you if you use the coupon.

Use coupon on page 93; circle No. 4-7

### For Concrete Repairs and Construction

The Bondact method provides for fast and economical air placement of concrete and is used for repair of disintegrated concrete, fabrication of precast sections, water tight application of concrete, sand blasting, lining and coating with cement mortar, and many other jobs. The Bondact gun handles one-half to 2 yds. of aggregate per hour and gives a coating of great density because of the low water ratio (about 3 gals. per sack of cement) and controlled application. Full data from Air Placement Equipment Co., 2525 Southwest Blvd., Kansas City 8, Mo., or by using the coupon.

Use coupon on page 93; circle No. 4-8

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940

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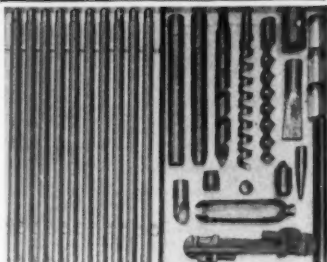
The 940 Roto-Trol will control your pumps, valves, alarm circuits, etc., all from one float. Each circuit is completely independent from all others, and may have several starting and stopping positions on both a rising and falling level. Can be set on the job. No special tools or experience required. All circuits, from two to ten or more, are made through snap action of mercury switches.

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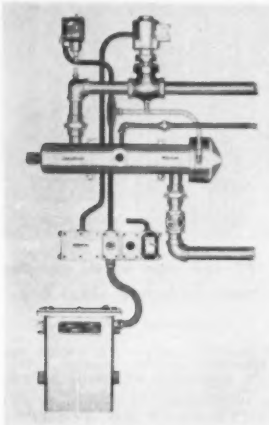
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### Small Water Sterilizer

This water sterilizer will handle up to about 3,000 gals. per hour and is suitable for very small industrial



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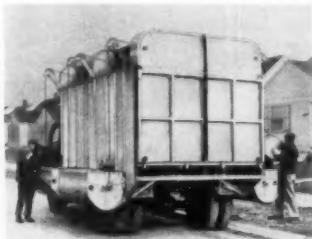
and municipal installations. It is not used for swimming pools. It does not use chemicals, and taste and physical structure of the water remains unchanged. It is said to be completely automatic. Information from

Hanovia Chemical & Mfg. Co., 100 Chestnut St., Newark 5, N. J. (ask for Steritron Technical Bulletin) or use the coupon.

Use coupon on page 93; circle No. 4-9

### Garbage Truck Reduces Collection Costs

Four hydraulically operating loading buckets, two on either side, give fast loading of this rust-proof alu-



**Fast loading for refuse.**

minum garbage collection unit. The body is lighter than most units of the same capacity. Dumping is by hydraulic controls and discharge is facilitated by tapering the interior of the body. The four-point loading is said to give better load distribution. Full data from Duncan & Gal-

PUBLIC WORKS for April, 1950

loway Co., 21650 Hoover Road, Detroit 5, Mich., or by using the coupon.

Use coupon on page 93; circle No. 4-10

### Light-Duty Four Wheel Drive Truck

This new FWD, the Model LD, has a gross vehicle weight of 14,500 pounds, and is designed for many jobs in the highway maintenance and municipal construction fields, such as street construction and maintenance, snow removal and refuse collection in bad terrain. Full information and specifications from



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### MUD-JACK\* cuts costs on slab repairs and maintenance



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### Roto-Beater for Grass and Weed Control

This machine may be termed a foliage disintegrator. It can be used as a highway mower, beating up weeds, long grass and small growth, and building up the soil through the addition of the organic material. It can be used on airports, vacant lots or any other place where hard and heavy mowing and disposal of the mowed material would be a problem. Information from Olson Mfg. Co., Boise, Idaho, or by using the coupon.

Use coupon on page 93; circle No. 4-12

### PERSONAL NEWS

Scott Keith, John W. Raymond, Jr., and Russell J. Rice have been made partners of Metcalf & Eddy, consulting engineers of Boston, Mass. All three men have been staff members for several years.

James I. Corbett is now associated with Hitchcock & Eastabrook, consulting engineers and architects, Minneapolis. He was recently city engineer of Menominee, Mich., and will have charge of the firm's office there.

Personnel changes in the Texas Highway Department have been an-

nounced as follows: Percy S. Bailey, formerly district engineer at El Paso, as State Maintenance Engineer, with E. W. Mars succeeding to the El Paso position. M. C. Welborn from Dallas district engineer to Engineer of Special Services at Austin. F. W. Cawthon succeeds to the Dallas post. E. C. Woodward becomes Principal Engineer-Consultant, his position as engineer-manager of the Fort Worth expressway being taken by Frank E. Lovett.

The six non-Government members of the Water Pollution Board have been reappointed by President Truman. They are: T. A. Berrigan, L. A. Danse, Stanley B. Freeborn, Michael Klein, Carl D. Shoemaker and N. T. Veatch.

### ASSOCIATIONS

Charles M. Upham, engineer-director of the American Road Builders' Association since 1926, announced his retirement at the 47th annual convention of the Association, held in Cincinnati March 6 to 9. Officers of the association, elected at this meeting, included: Col. E. R. Needles, Pres.; vice presidents, Paul B. Reinhold, Charles W. Smith, W. A. Roberts, and T. E.

Stanton. Jennings Randolph was re-named treasurer. Division presidents included: Nello Teer, Jr., Contractors'; Howard L. Way, County Highway Officials; H. H. Kranz, Municipal; and Jennings Randolph, Airport.

The Central States Sewage Works Association will hold its annual conference at the Hotel Lincoln, Indianapolis, Ind., June 9 and 10. Paul W. Reed, 69 West Washington St., Chicago 2, Ill., is secretary-treasurer.

The 18th annual short course on water supply and sewerage will be held under the Chairmanship of David B. Lee, June 5 to 10, at Gainesville, Fla.

The American Water Works Association's nominating committee has made the following nominations for the 1950-51 year: President, W. Victor Weir; vice president, Dr. A. E. Berry; and treasurer, W. W. Brush.

### PIPE FOR SALE

SURPLUS Cast Iron flanged pipe and fittings, assorted sizes. One 440,000 gallon steel stand-pipe, 30 feet in diameter, 120 feet high, 5 foot rings. For additional information contact A. M. McBrayer, Purchasing Agent, Room 203 Municipal Bldg., Muskogee, Oklahoma.

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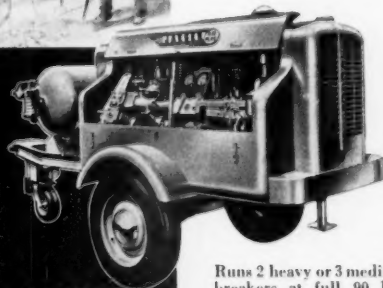


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MODEL 125**  
obsoletes  
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now done in 3**

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## NEW LISTINGS

### Design of Septic Tanks When Using Home Garbage Grinders

26. The use of a Youngstown Kitchens food waste disposer with a septic tank is thoroughly discussed in a new booklet released by Mullins Mfg. Corp. Tables show tank sizes for new construction, recommendations are made for improvements and better operation of existing systems, and a wealth of other valuable information is provided. For a free copy use coupon or write to Mullins Mfg. Corp., Dept. PW, Warren, Ohio.

### Data on Easy Treatment To Increase Timber Life

70. Decay and insect destruction of wood is effectively resisted with toxic "Osmosalts", easily applied to green wood by dipping, brushing or spraying. 16-page illustrated bulletin shows how all species of wood may be treated. Osmose Wood Preserving Co., 1437 Bailey Ave., Buffalo 12, N. Y.

### Traveling Loader Speeds Highway Cleanup

74. A high-speed, heavy-duty loader for highway officials and contractors is described in the Adams Traveler bulletin 4914, issued by J. D. Adams Mfg. Co., Indianapolis, Ind. Self propelled, self feed, belt type loader quickly transfers windrowed materials to trucks.

### How to Protect Your Water Tank

89. How to stop steel tank rust by the cathodic protection method is clearly described in bulletins issued by the Rusta Restor Div., Harco Corp., 2136 East 4th St., Cleveland 15, Ohio. Be sure to check on this method for lasting protection against rust.

### Screen Data for Every Water Well

107. Full data is available on Johnson Well Screens which feature greater intake capacity, Full V-shape, greater strength and tailor-made construction to fit any well and any sand or gravel condition. Get bulletin from Edward E. Johnson, Inc., Dept. PW, St. Paul 4, Minn.

### How to Make Metal Cutting Faster, More Efficient

123. Pipe up to 10", structural shapes and heavy solid stock can be cut with speed, ease and perfect accuracy with the Johnson metal cut-off band saw. If you are not familiar with this modern machine get free data now by using handy coupon, or write Johnson Mfg. Corp., Albion, Mich.

### Investigate This Single Pass Crushing and Screening Plant

125. A new bulletin shows design features and operating principles of the Cedarapids single pass crushing plant. Diagrammatic flow sheet and complete specifications are included. Get Bulletin SFP-1 from Iowa Mfg. Co., Dept. PW, Cedar Rapids, Iowa.

### Light Weight Machine Does Work of Heavy Roller

152. For compacting hot or cold patching material be sure to investigate the Wayer Impactor. 2,000 blows per minute tamps, finishes and cures. All data in Bulletin 25-8. Wayer Impactor Sales Co., 12 No. Third St., Columbus 15, Ohio.

### Getting the Power To The Wheels

128. A colorful new 24-page catalog shows the operating principle of the General Motors Diesel Engine Torque Converter Unit for a smooth power flow on any job. Applications to tractors, off-the-highway vehicles, excavators and other equipment with varying load conditions are described and illustrated with interesting diagrams. Free copies from Dept. PW, Detroit Diesel Engine Div., General Motors Corp., Detroit 28, Mich.

### How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept. PW, Warren, Ohio.

### Do You Have Dependable Grade Crossing Protection?

144. Grade crossings in all communities demand 4-hour protection. Investigate the modern design, dependable performance and low cost operation of Griswold Automatic Crossing Gates, described in new two-color Bulletin No. 110. Copies available from Griswold Signal Co., 1706 Linden Ave., Minneapolis, Minn.

### Helpful Painting Chart For Sewage Plants

153. Specific data on surface preparation and priming, and a handy chart showing the proper type of paint for all surfaces and sewage plant conditions are included in new Bulletin 586 published by Inertol Co., Inc., 480 Frelinghuysen Ave., Newark 5, N. J.

### Reference Manual on Guardrail Design

114. Here is an interesting and informative booklet in which all factors influencing guardrail design are outlined, and safety and economy discussed in detail. Eight pages are devoted to basic design data, with handy tables covering physical properties, tensile and beam strengths, deflection and other data. Write Armo Drainage and Metal Products, Inc., Dept. PW, Middletown, Ohio.

### Hydraulic Dump Bodies Feature Trouble-Free Moist

165. Get data on Heil Twin-Arm hoists and bodies for 1½ to 2½ ton trucks and learn how reliable hoist and sturdy body will keep your truck in service with less repair and maintenance. Bulletin BH 4662-G gives details. The Heil Co., Dept. PW, 3000 W. Montana St., Milwaukee 1, Wisc.

### Handy Calculator for Cast Iron Pipe

175. With the handy Cast Iron Pipe Calculator you can determine at a glance the class, weight and dimensions of bell and spigot pipe. This slide-rule type calculator is absolutely free. Use coupon or write R. D. Wood Company, Public Ledger Bldg., Philadelphia 5, Pa.

### Filtration for Swimming Pools With Sand or Diatomite

200. A 28-page catalog covering all the equipment necessary to supply clean, safe water to swimming pools is available from Lakeside Engineering Corp., Dept. PW, 222 W. Adams St., Chicago 2, Ill. Pressure filters, controls, diatomite filters and all pool accessories, together with suggested operation are described in this useful manual.

## REFUSE COLLECTION AND DISPOSAL

### Seven Advantages of Sanitary Land Fills

171. Development of sanitary fills to lower sanitation costs and steps for the proper operation of these fills are described in bulletin 12314 titled "Lowering Health and Sanitation Costs" and issued by Caterpillar Tractor Co., Peoria 8, Ill.

### How to Lower Costs Of Refuse Collection

35. For saving trucks, labor and time in city rubbish collection get details of the new Dumpster-Kollector described in literature just published by Dempster Bros., Inc., 996 Higgins, Knoxville 17, Tenn.

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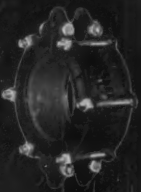


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### How to Beat the Weed Problem

85. Be sure to investigate weed control with selective chemical weed killers. Ask for bulletins on Dolge products that will rid roadsides, parks and lawns of the weed nuisance. C. R. Dolge Co., Dept. PW, Westport, Conn.

### An Incinerator Necessity

139. Recuperators featuring silicon carbide heat transfer tubes and fireclay concrete-busters for maximum efficiency are described and illustrated in Bulletin 11 issued by Fitch Recuperator Co., Dept. PW, Plainfield Natl. Bank Bldg., Plainfield, N. J.

### How You Can Improve Your City's Street Cleaning

162. The Austin-Western Model 40 sweeper features three wheel design, front wheel steer, for easy maneuvering; rear broom to sweep dirt and refuse directly into 2-yd. hopper; built-in flushing device. Diagrams showing all operations and full specifications in Bulletin AD-2042, issued by Austin-Western Co., Aurora, Ill.

## WATER WORKS

### What You Should Know About Hypochlorination

20. This really helpful booklet tells you a lot about hypochlorination of water for small and medium sized supplies, swimming pools and main sterilization, and fully describes the application of manual and automatic "Chem-O-Feeders" for constant or proportional feeding of chemicals. Send for Bulletin SAN-8 issued by Proportioners, Inc., Box 1342, Providence 1, R. I.

### How To Eliminate Pumping Stations With Submersible Pump Units

23. Ten big advantages of submersible deep well turbine pump and waterproof electric motor units include pump house elimination, permitting installation in park or residential areas where pump house structures would not be acceptable. Available pump types cover various heads and wide capacity ranges. Complete data in Bulletin No. 49-5200 published by Byron Jackson Co., Dept. PW, Los Angeles 54, Calif.

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25. One-man operated Hydraulic Pipe Pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts and prices, ask for booklet S-117, Greenlee Tool Co., Dept. PW, 2136 Twelfth St., Rockford, Ill.

### Water Level Controls for Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletin issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hampden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches.

### Is Your City Metered 100%?

33. 100% metering as practiced by many cities requires accurate, dependable meters with interchangeable parts. Cut-away views of every part, capacity and size data are all included in handsome American-Niagara water meter booklet available from Buffalo Meter Co., 2920 Main St., Buffalo 14, N. Y.

### Do Your Water Mains Need Cleaning?

33. Literature on Flexible method of cleaning water mains any size from 2" to 72", giving full details and list of nearest representatives in all parts of country. Address: Flexible Underground Pipe Cleaning Co., 9059 Venice Blvd., Los Angeles, Calif.

### Helpful Data on Swimming Pools

59. Data on injector nozzles for complete recirculation, fittings for correct drainage and other useful information for pool design are covered in Manual SP issued by Josam Mfg. Co., 335 Josam Bldg., Cleveland 13, Ohio.

### Data on Modern, High-Rate Water Treatment Plant

40. This handsome 28-page bulletin gives a comprehensive, yet understandably written story of the development of the Accelerator, and explains its principles, advantages, design considerations, operation and applications. Helpful flow diagrams and specifications. For a copy use the coupon or write Infillo Inc., 325 W. 25th Place, Chicago 16, Ill. Ask for Bulletin 1825.

### Improved Clarification with Carter Circular Collectors

61. Latest 16-page bulletin on water and sewage equipment, No. 4906, gives complete data and specifications on Carter's three different types of clarifiers. A valuable working guide for every sanitary engineer. Ralph B. Carter Co., Dept. PW, 192 Atlantic Ave., Hackensack, N. J.

### Helpful Data on Hydrants

64. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M. & H. Valve & Fittings Co., Dept. PW, Amistown, Ala.

### Cast Iron Pipe and Fittings For Every Need

65. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-de-La-vaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Dept. PW, Burlington, N. J.

### Pump Bulletin Helps Figure Head, Capacity

75. Maximum efficiency and lowest maintenance results from fitting pump to a particular job. Installations in water and sewage pumping stations are covered in Allis-Chalmers bulletin 08B6146A which describes single stage, double suction pumps, shows how to figure all factors in head, and has many useful tables. Allis-Chalmers Mfg. Co., 1189 S. 70th St., Milwaukee, Wis.

### Turbidity, Color and Hardness Removal

77. Modern water pre-treatment with Dorr equipment and methods is described in Bulletin No. 9141, which gives basic design data and flowcharts for pre-treating highly turbid water, color removal or treatment of low turbidity, and softening. Typical analyses for various types of waters are given together with detention times in recommended treatment units. Write The Dorr Co., Dept. PW, Barry Pl., Stamford, Conn.

### All Electric Floatless Liquid Level Control

78. Description of operating principles and applications of B/W controls shows the simplicity and many uses of these all-electric, floatless devices. Diagrams of typical installations and engineering data all in bulletin 147 issued by B/W Controller Corp., Dept. PW, Birmingham, Mich.

### Now You Can Actually See Your Chlorine Residual

79. By using the Wallace & Tiernan residual chlorine recorder you can get better chlorination control because you actually see at all times the residual being carried. The 24-hour charts provide a valuable record and check on operating irregularities. More data on what the recorder is and what it does are covered in Bulletin M-20-S, Wallace & Tiernan, Dept. PW, Newark 1, N. J.

### Job Data Offered on New Steel Water Lines

80. A 12-page illustrated report listing pipe diameters, pipe wall thicknesses, line pressures, coatings, engineering personnel, etc., is entitled "A Report of Dresser-Coupled Steel Water Lines in the Year 1948." A copy will be sent by Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

### Speedier, Space-Saving Purification Apparatus

81. A new 12-page bulletin, No. 2204, tells how the Spaulding Precipitator, in removing impurities from a liquid by precipitation, adsorption, settling, and upward filtration, occupies less space, uses less chemicals and speeds up treatment. Permit Co., 330 West 42nd St., New York 18, N. Y.



### How to Estimate Quantity Of Joint Compound Needed

87. The uses of Tegul-Mineral for bell and spigot pipe and G-K Sewer joint compound are described in bulletins issued by Atlas Mineral Products Co., Merztown, Pa. Includes useful tables for estimating quantities needed.

### Flow Meters With Many New Features

91. The new Propello meter for main-line metering introduces many new features you will want to look into. Send for latest bulletin today. Builders-Providence, Inc., Box 1342, Providence 1, R. I.

### Keep That Trench Pumped Really Dry!

93. To find out how well a Homelite Carryable Pump handles large volume, sewage, mud, write today for illustrated bulletin L-503 containing data of great value to all pump users. Write Dept. PW, Homelite Corp., 2110 Riverdale Ave., Port Chester, N. Y.

### Useful Data on Butterfly Valves

100. Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves is contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., 200 Eliot Street, Fairfield, Conn.

### Tested Jointing Materials

102. "Hydrotite" is a self-caulking, self-sealing joint compound for bell and spigot pipes. For data book and sample write Hydraulic Development Corp., 50 Church St., New York, N. Y.

### Well Water Systems Built to Last

105. Layne pumps are built for wells ranging from 4" to 36" diameter and in capacities from 50 to 16,000 gpm. Full engineering data and many installation views are given in 32 page Pump Bulletin 4-42. Layne and Bowler, Inc., Memphis, Tenn.

### Pressure Pipe That Retains Capacity

106. Several bulletins describing the construction of pressure pipe, list of installations, carrying capacity tests, making service connections under pressure; and detail descriptions of several installations. Lock Joint Pipe Co., Box 269, East Orange, N. J.

### Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

### Do You Ever Have Leaks to Fix?

124. You'll want to know about the full line of "Skinner-Seal" clamps for repairing bell and socket joint leaks and broken mains. Step-by-step procedures are illustrated in catalog 41, a handsome 40-page presentation which shows applications of all fittings. Write M. H. Skinner Co., Dept. PW, South Bend 21, Ind.

### The Modern Way to Filter Swimming Pool Water

129. That's the title of a bulletin full of facts about Bowser's new diatomite filter to produce clear, sparkling, clean water at low cost. Occupies small space, doesn't waste water. Gives sizes to use, performance charts, etc. Write Bowser, Inc., Dept. PW, 1395 Creighton Ave., Ft. Wayne, Ind.

### How Elevated Water Tanks Can Save on Operating Costs

134. Beautiful new booklet on Horton elevated steel water tanks suggests ways to reduce pumping costs, increase capacity of systems, maintain uniform pressure, etc. Illustrates 7 models of welded, ellipsoidal-bottom, elevated steel tanks in full color. Write Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4, Ill.

### All About Cement-Mortar Lining of Water Mains

133. Here, in a really beautiful booklet, is practically everything you need to know about this method of lining mains in place—the needs, methods, and results that will interest you. Centrilite Corp., Dept. PW, 140 Cedar St., New York 6, N. Y.

### Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and pre-caulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

### "Tailor-Made" Pumps Fit Your Requirements

156. Application-Engineered vertical turbine pumps to suit your particular pumping requirements are completely described in Bulletin P-178. Details of optional driving and pumping arrangements clearly illustrated. Get your copy from A. O. Smith Corporation, Dept. PW, Milwaukee 1, Wis.

### Helpful Data on Corporation Stops

161. A complete line of brass goods for water works: corporation stops, curb stops, service pipe couplings, goosenecks and other fittings are illustrated and described in catalog W-39, issued by A. Y. McDonald Mfg. Co., Dubuque, Iowa. Get your copy for ready reference.

### What You Should Know About Meter Setting and Testing Equipment

166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

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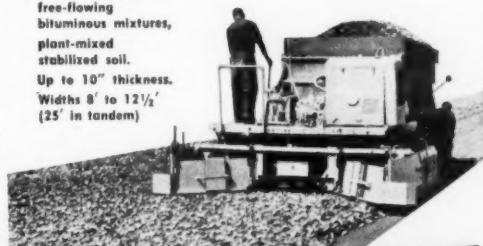
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131. Finding buried pipe is easy with the new Featherweight Goldak Pipe Locator. An easy-to-read illustrated bulletin tells the full story quickly. Address: The Goldak Co., 1544 Glenoaks Blvd., Glendale 1, Calif.

## Easily Cleaned, Long Run Filter Bed Media

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## CONSTRUCTION EQUIPMENT

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21. Shows typical sections for designing walls, pictures many applications, specifications, etc. Get the facts today about this economical reinforced concrete cribbing. Universal Concrete Pipe Co., Dept. PW, 297 So. High St., Columbus 15, Ohio.

### Methods of Installing Steel Sheet Piling

30. Illustrated descriptions of both standard and interlock corrugated steel sheet piling of minimum weight, maximum strength, ease of handling with methods of installation are contained in a booklet. If you have a job involving piling write Caine Corr-Plate Piling Co., Dept. PW, 2535 S. State St., Chicago 16, Ill.

### Federals Feature Lower Costs On Hauling Jobs

39. Heavy duty hauling ability for construction jobs and dependable power for maintenance work are built into all Federal trucks described in colorful new folder. A broader range of trucks covers models from medium to highest tonnage capacities. Full specifications from Federal Motor Truck Co., Dept. PW, Detroit 9, Mich.

### Speed Your Work With These Powerful Motor Graders

48. Two powerful Galion motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

### How to Keep Your Loader On the Job

50. Don't take more time to move your loader to the job than to do the work. Investigate the Eagle Truck Mounted Loader for handling gravel, sand, cinders, snow from windrows or piles. Get forms 444 and 947 from Eagle Crusher Co., Inc., Galion, Ohio.

### Municipalities Make Equipment Dollars Go Further

55. Be sure to get your copy of "Saving Facts" a new illustrated booklet prepared by The Oliver Corp. that shows how equipment dollars can be stretched on municipal work. Text and photos describe the application of tractors and money-saving attachments in street maintenance, snow removal, waste disposal, pipe laying and other projects. Write The Oliver Corp., Industrial Div., 19300 Euclid Ave., Cleveland 17, Ohio.

### Data and Pictures of Complete Line of New Ford Trucks

58. Check this number on the coupon for colorful circular showing new Ford Trucks for every hauling need, available in great variety of standard, factory-built chassis and body combinations. Be sure to check these trucks on your job. Truck and Fleet Sales Dept., Ford Motor Co., Dearborn, Mich.

### 52-Page Data-Packed Bulletin On Contractors' Pumps

95. Tables for pump size determination on every excavation job, pipe friction loss, attitude effects and lots of other valuable data are included in this comprehensive booklet illustrating the many Jaeger "sure-priming" pump applications. Get your copy (catalog P45) by checking our coupon or writing the Jaeger Machine Co., Dept. PW, Columbus 16, Ohio.

## USE COUPON ON PAGE 93 TODAY TO ORDER THE LITERATURE YOU NEED.

### The Right Tractor For Your Job

116. Whether you need a front-end loader, snow plow, bulldozer, sweeper or mower, International wheel tractors combine correctly with allied equipment to do the job. Your choice of gasoline or diesel units is illustrated in Bulletin A-103JJ. International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

### International Trucks Are Built to Take It

120. Trucks take a pounding in construction work—that's why you need data on International Trucks that are engineered for your job. Check the coupon or write International Trucks, Dept. PW, 180 N. Michigan Ave., Chicago 1, Ill.

### New 15,000 GPH Pump Weighs Only 57 Pounds With Engine

150. Together, the 5-HP engine and 15,000 GPH (250 GPM) pump just introduced by McCulloch weigh only 57 pounds. Pump has 28-ft. suction lift; 3-in. outlet and inlet; automatic governor. Get complete information in Bulletin 4960 from McCulloch Motors Corp., Dept. PW, Los Angeles 45, Calif.

### Check "Gunite" Concrete For Every Application

158. Big 44-page book illustrates "Gunite" uses for both repair and new construction of sewers, tanks, dams, swimming pools, and all concrete structures. A multitude of applications. crete Co., Dept. PW, 315 S. Court St., Florence, Ala.

### Mack Trucks for Every Road Building Job

184. An illustrated bulletin entitled "Mack Builds the Highways of the Future" tells the story of Mack trucks on the heavy work of highway building and shows how Mack design meets the extra demands of this use. Copies available from Mack Mfg. Corp., Empire State Building, New York 1, N. Y.

## POWER AND LIGHT

### Using Sewage Sludge Gas For Power Generation

27. A new 8-page illustrated bulletin, No. 4811, describes Superior Dual Fuel Diesel engine operation and illustrates the simplicity of controls with fuel conversion by either push buttons or hand lever. Copies are available from Superior Engine Div., Dept. PW, The National Supply Co., Springfield, Ohio.

### Air Cooled Engines for Hundreds of Applications

137. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "right" power for hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wis.

### Low Cost Power From Dual Fuel Engines

134. Operating on the Diesel cycle, burning either oil or gas, the Worthington Super-charged Dual Fuel Diesels give high economies by running on the cheapest fuel available. Get complete data from Worthington Pump & Machinery Corp., Dept. PW, Harrison, N. J.

## STREETS AND HIGHWAYS

### Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 10, Wis.

## PUBLIC WORKS for April, 1950

### New Unit Cleans Catch Basins in a Jiffy

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

### For High-Speed Snow Removal

44. "Frink One-Way Sno-Flows" is a four-page catalog, illustrating and describing 3 models of One-Way Blade Type Sno-Flows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow, Frink Sno-Flows, Inc., Clayton, 1000 Islands, N. Y.

### Latest Maintenance Equipment for Blacktop Roads

52. "Blacktop Road Maintenance and Construction Equipment"—Asphalt and tar kettles, flue type kettles, spray attachments, tool heaters, surface heaters, road brooms and rollers. This is modern and up-to-date equipment for blacktop airport and road construction and maintenance. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, Ohio.

### Drill Concrete With Your Ordinary Electric Drill

82. Substantial cost-per-hole savings are claimed for Tilden Rotary Drills which penetrate concrete 2" to 4" per minute. Cutters can be resharpened. Available in sizes ¼" to 1". Get full data from Tilden Tool Mfg. Co., 1995 N. Fair Oaks Ave., Pasadena 3, Calif.

### Improved Special Rollers Help Cities and Counties

84. Road and street widening are speeded up with Buffalo-Springfield trench rollers of improved design. Many other special compacting problems handled by the portable KT-6 model. Get engineering specifications in bulletins TR-1B and KT-6 from Buffalo-Springfield Roller Co., Springfield, Ohio.

### "A Decade of Duraplastic Air-Entraining Cement"

121. This is the title of an illustrated booklet which tells the development of Portland Air-Entraining Cement from its initial use ten years ago to its present acceptance by highway engineers. Get a copy by using coupon or write Atlas Cement Co., Dept. PW, Chrysler Bldg., New York 17, N. Y.

### Uniform Spreading 2 to 10 ft. Wide

136. Saves labor, spreads 0 to 100 lbs. a sq. yd., dusts up to 1" material forward, reverse, on curves, hills or straightaway. Assures uniform, even density of spread. Write for bulletin: Dept. PW, All Purpose Spreader Co., Fuller Road, Elyria, Ohio.

### Versatile Maintainer Has Year 'Round Usefulness

151. A new bulletin shows how the sturdy Huber Maintainer will work for you the year 'round on maintenance jobs, berm leveling, road planing, bull-dozing, snow plowing, brooming, mowing shoulders and as a patch roller. Good ideas on how to do all these jobs in Bulletin No. M-138. Write Huber Manufacturing Co., Dept. PW, Marion, Ohio.

### Useful Data for Highway Builders In Barrett Road Book

190. The latest edition of "The Barrett Road Book" has 54 pages of helpful tables and step-by-step outlines of highway maintenance and construction with Tarvia and Tarvia-lithic. Tables show quantities per yard and mile; aggregate gradings; costs; many others. Get this useful book from Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

### How to Get Good Grass for Roadside Shoulders

193. For every step in lawn care and seasonal maintenance hints be sure to read "Lawn Care," an interesting periodical sent without obligation by O. M. Scott & Sons Co., 80 Spring St., Marysville, Ohio.

### Two-Way FM Radio Telephone Equipment for All Departments

197. The benefits of two-way radio communication for all departments of municipalities and counties make full information on this

subject important to all engineers. For descriptions of Motorola FM systems, or for specific recommendations concerning your application write to Dept. PW, Motorola, Inc., 4545 Augusta Blvd., Chicago 51, Ill.

#### Helpful Data on Distributors For Bituminous Materials

198. Two models of pressure distributors featuring uniform pressure and temperature, accurate displacement pumping are covered in Bulletins RS6145 and RS12046, available from Standard Steel Works, Dept. PW, North Kansas City, Mo.

## SEWERAGE AND WASTE TREATMENT

#### Complete Catalog for Engineers Shows Sewage Plant Equipment

110. A complete, 44-page catalog gives engineering data on Jeffrey equipment for water, sewage and industrial waste treatment plants including screening, screenings grinder-grit collectors and washers, settling tank collectors, feeders, Floctrols, mixers and other mechanical equipment. Use coupon to get Catalog 775-A, Jeffrey Mfg. Co., Columbus 16, Ohio.

#### How to Keep Trenching Jobs on Schedule

24. The easy maneuverability of the tough, compact Cleveland Model 95 "Baby Digger" makes it well suited for the difficult job of trenching past the many obstacles of city and suburban work. Multiple digging and crawler speeds handle all soil types and trench widths up to 24". Get Bulletin S-52 from Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

#### Packaged Sewage Treatment—Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

#### Solve Corrosion Problems With This Special Alloy

41. "Everdur Metal" is title of an 8-page illustrated booklet describing advantages of this corrosion-resisting alloy for sewage treatment equipment, reservoir, and waterworks service. Dept. P.W., the American Brass Co., 25 Broadway, N. Y. C.

#### Design Details for Sludge Collectors

42. Booklet No. P.W. 1982 on Link-Belt Circuline Collectors contains sanitary engineering data and design details. Catalog No. 1742 on Straightline Collectors, contains layout drawings, illustration pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

#### How to Pump Debris Laden Water

63. Bulletin 167-D describes the Novo lift-and-force diaphragm pumps which feature compact design, easily opened cleanout ports and triple-life diaphragms. 3" and 4" sizes handle water laden with large amounts of debris and abrasives, and containing large percentages of air. Copies from Novo Engine Co., Lansing 5, Mich.

#### Odorless Sanitary Septic Tank Cleaning

88. The Gorman-Rupp Odorless Sanitary Cleaning unit combines centrifugal self-priming pump, air-cooled engine and oval tank on a sturdy frame. For full description of this adaptable unit get bulletin 7-ST-11. Gorman-Rupp Co., 120 N. Bowman Ave., Mansfield, Ohio.

#### How to Improve Coagulation and Sludge Conditioning

111. "Ferro-Floc" description and instructions for use in coagulation, sludge conditioning and treating industrial wastes, fully treated in a 24-page pamphlet. Tennessee Corp., 619-27 Grant Bldg., Atlanta 1, Ga.

#### The Vacuum Filter In Your Home Town

182. That is the title of bulletin F-2005 issued by The Eimco Corp. Data on dewatering sewage sludge by actual installations are included. Write Eimco Corp., Salt Lake City 8, Utah.

#### How Cities Can Do Complete Sewer Cleaning From Street

98. Literature illustrating how cities, towns and villages using OK Champion Sewer Cleaners are doing a complete sewer cleaning job from street level. Power machines available in addition to full line of sewer rods and accessories. Issued by Champion Corporation, 4752 Sheffield Avenue, Hammond, Indiana.

#### Vitrified, Salt Glazed Filter Bed Block

86. An 8-page folder contains instructive design applications and detailed descriptions of Dickey underdrain tile for filter bed bottoms. Diagrams show how air passes up through blocks for filter ventilation. Issued by W. S. Dickey Clay Mfg. Co., 922 Walnut St., Kansas City 6, Mo.

#### Engineering Facts About Transite Pipe

83. This compilation of Johns-Manville's "Engineering Facts" series presents concise, factual information about Transite's many eco-

nomie and engineering advantages, and includes informative case histories plus dimensions and data for your files. Write Johns-Manville, Box 290, New York 16, N. Y., or use the handy coupon.

#### Underdrains—Hidden But Important Filter Components

113. For filter bottoms this firm makes "Armco" vitrified salt glazed floor blocks which provide ducts occupying 50% of the floor cross-section and air openings aggregating over 24% of the floor area. Described in several leaflets and data sheets. Ayer-McCord-Reagan Clay Co., Brazil, Ind.

#### Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment; constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Roots-Connersville Blower Corp., 504 Poplar Ave., Connersville, Ind.

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Centrine

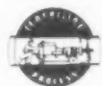
86 %  
is worth  
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140 CEDAR STREET  
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Branch Offices in all  
Principal Cities of the  
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Washington, D. C. installed the equivalent of approximately 5 miles of 36" mains in various parts of its distribution system at a cost of approximately \$4.00 per foot. This was in contrast to the normal cost of around \$28.00 per foot required for new mains of this size. This economy was realized by cleaning and cement lining a group of 36" cast iron water mains thereby raising the W-H coefficient from an average of 80 to more than 140—an increase of 75% in carrying capacity.

The improvements in the operation of the system were immediate. The pressures available to the suction side of the high-service pumps constantly stayed above 20 p.s.i. after cleaning and lining, whereas they had formerly dropped to 15 p.s.i. This 5-pound increment alone had raised the discharge considerably. The total cost to the District for the cleaning and lining of these 36" mains in paved city streets, including field work, engineering, overhead and services, was \$3.92 per linear foot.

**CEMENT MORTAR LININGS FOR WATER MAINS**  
**CENTRIFUGALLY APPLIED** in strict conformity with  
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## NEW APPLICATIONS FOR

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HEADQUARTERS FOR COLORIMETRIC APPARATUS

## TEST WATER HARDNESS

this SIMPLE, FAST, ACCURATE way

## TAYLOR TOTAL HARDNESS SET

This new Taylor Set replaces the slow, inconvenient soap test... makes fast, accurate determinations on waters ranging in hardness from 1 to 1400 p.p.m. ... ideal for checking boiler water or as a control test on zeolite or lime-soda treated waters.

HERE'S HOW SIMPLE A WATER HARDNESS TEST CAN BE . . .

You simply place a 50 cc. sample of the water to be tested in a 250 cc. flask with 2 drops of Taylor Hardness Indicator and 1 cc. of Taylor Hardness Buffer. At this point the sample will be red. Add Taylor Hardness Reagent from a burette until the red color changes sharply to blue. Multiply the burette reading in cc. by 20 and

*There's the Value!*

Write For  
Complete Information

Each Taylor Total Hardness Tester is sold complete... includes all necessary equipment and reagents. Write direct for prices and additional information. Also ask for the Taylor Handbook, "Modern pH and Chlorine Control".



**W. A. TAYLOR AND CO.**  
7304 YORK RD. • BALTIMORE-4, MD.

## WORTH TELLING . . . By Arthur K. Akers

Caterpillar Tractor Company announces **William Kusz** as new supervisor of industrial advertising; succeeding **K. M. Emery**, to Hosler ad-



Mr. Kusz



Mr. Farley

vertising agency, Peoria. **T. R. (Ted) Farley** has been named general manager of **Caterpillar's** new plant near Joliet, Ill.

**Nelson Thompson**, vice-president of **Homelite Corporation**, Port Chester, N. Y., tells of four new territories in the southeast to handle **Homelite** sales and service on portable pumps, generators, blowers, and chain saws. **Bill Bedford** will manage Memphis territory; **Ty. Lubby**, Charlotte; **Jim Anderton**, New Orleans; and **Norman Supove**, Jacksonville.

If you spot a new diamond ring on the finger of a **Detroit Diesel Engine Division** of **General Motors** salesman chances are he is one of the ten who have just been awarded these rings for master selling of diesels.

**J. Ross Holland** is new factory sales representative for **Federal Motor Truck Company**, headquartered in Oklahoma City. **F. Jule Weiland** has the new Oklahoma City post.



Mr. Holland



Mr. Finley

**Col. Bernard E. Gray**, president of the **Asphalt Institute**, New York, says that **George B. Finley** is district engineer in charge of their new Austin, Texas, office.

**A. O. Smith Corporation**, Milwaukee, will now manufacture **SMITH-way** fractional hp motors to specification. **D. L. Mills**, former president of **Whirl-A-Way Motors Inc.**, becomes **Smith's** eastern regional sales manager, assisted by **Hal E. Rowland** at Dayton; **J. P. Hoffberger**, New York; and **R. O. Dehlendorf**, Chicago.

**Foundation Equipment Corporation** has been formed by **Max H. Rothschild** to take over much of the shop, inventory, and personnel of **Complete Machinery and Equipment Company**, Long Island City, N. Y. **Marlow Pumps**, **Ingersoll-Rand**, **Mall Tool**, and **Gar-Bro Manufacturing Company** lines will be distributed; also wellpoint systems and jetting pumps manufactured.

**Glen M. Alford**, sales manager of the newly-created **Industrial Products Division** of **Modglin Company**, Los Angeles 65, will promote nationally **Permene** fiber for rotary street sweeping equipment.



Mr. Alford



Mr. Malme

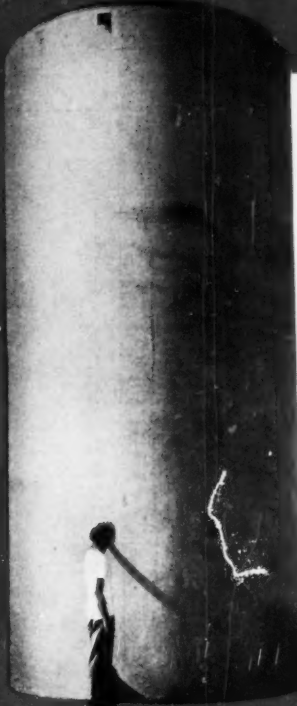
**Glenn W. Malme** is now in charge of customer relations and sales promotion, **McCulloch Motors Corp.**, Los Angeles 45.

**Stacey-Dresser Engineering Division** of **Dresser Industries** is moving to 5535 Vine Street, Cincinnati 16, from Cleveland.

**Jack P. Orr** is new sales manager of the southern branch of **Rensselaer Valve Company** division of **Neptune Meter Company**, with offices in 1020 Derman Building, Memphis. Several new salesmen will be added in the south.

**Syntron Company**, Homer City Pa., makers of vibratory and portable power tool equipment, moves its New York City office to 1860 Broadway.





*From mammoth  
to midget...*

**according to  
your requirements**

36" Lock Joint Reinforced Concrete Pressure Pipe  
and 16" Lock Joint Prestressed Concrete Cylinder Pipe

Whether your daily water consumption demands be 3,000,000 gallons or hundreds of times that figure, Lock Joint Pipe Company is prepared to provide a supply line for your requirements.

In the last few years the Company has supplied not only hundreds of miles of large diameter pipe but also more than a million feet of 16" to 24" pipe for municipalities and industry. This has been made possible through the establishment of three permanent manufacturing plants. Lock Joint Concrete Pressure Pipe

from 16" to 42" in diameter, produced at these plants, can be shipped economically to all parts of the country—for both major installations and minor extensions.

Our representative will be glad to discuss with you any water supply or transmission project which calls for pressure pipe 16" in diameter or larger. You will find that Lock Joint Concrete Pressure Pipe's superior characteristics of long life, continuous high flow and negligible upkeep will recommend it above all others for any permanent water supply installation.

**SCOPE OF SERVICES**—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

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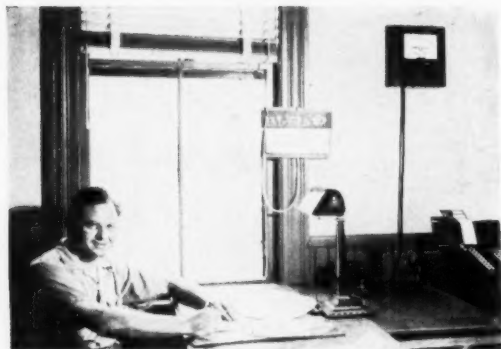


**LOCK JOINT**  
*Reinforced Concrete*  
**PRESSURE PIPE**



# W&T RESIDUAL RECORDER

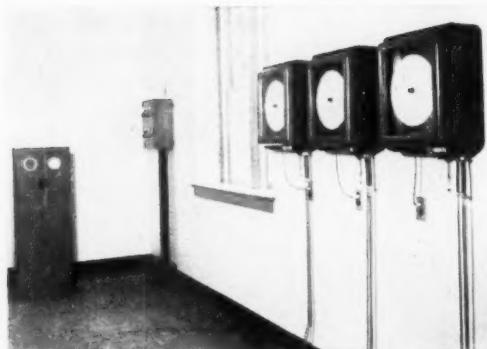
## Aids Chlorination Control at NEW HAVEN Filter Plant



A wall mounted Remote Residual Indicator gives Dr. Samuel Jacobson, Chemist at Lake Whitney Filter Plant, a direct residual reading in his office.



Wallace & Tiernan Residual Chlorine Recorder at Lake Whitney Filter Plant.



Wallace & Tiernan Chlorine Flow Recorders at the Pre-Chlorination Station of the Lake Whitney Filter Plant.

At the Lake Whitney Filter Plant of the New Haven Water Company a W&T Residual Recorder furnishes a *permanent, continuous record* in ppm of the free chlorine residual ahead of the slow sand filters. At any instant the plant operator can read the chlorine residual directly from the Recorder Chart, make any adjustments required, and then check the results by again reading the Recorder—all in a matter of minutes. Thus, changes in the raw water quality or pumping rates can be compensated for immediately, and fast, precision control obtained—the kind of control that helped chlorination to increase filter runs by several months at New Haven and upped filter capacity by as much as 72%.

New Haven's experience, however, gives only one example of the ability of the Recorder. This same instrument is successfully at work in other cities of all sizes. Bellevue, Pennsylvania; Bellingham, Washington; Cleveland, Ohio; Kansas City, Missouri; and Atlanta, Georgia—to name only a few—are all now enjoying the benefits of residual recording.

Find out now from your nearest W&T Representative how the W&T Residual Recorder—by furnishing a permanent record of performance—can bring you such advantages as better chlorination control, improved chlorine usage, and increased operating efficiency.

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